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POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268-0001

| POSTAL RATE AND FEE CHANGES, 2000 | Docket No. R2000–1 |
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DIRECT TESTIMONY
OF
CARL G. DEGEN
ON BEHALF OF THE
UNITED STATES POSTAL SERVICE

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# AUTOBIOGRAPHICAL SKETCH

My name is Carl Degen. I am Senior Vice President of Christensen Associates, which is an economic research and consulting firm located in Madison, Wisconsin. My education includes a B.S. in mathematics and economics from the University of Wisconsin-Parkside and an M.S. in economics from the University of Wisconsin-Madison. I earned an M.S. by completing the coursework and qualifying examinations for a Ph.D., but did not complete a dissertation. While a graduate student, I worked as a teaching assistant for one year and a research assistant for two years. In 1980 I joined Christensen Associates as an Economist, and was promoted to Senior Economist in 1990 and Vice President in 1992. In 1997 I became Senior Vice President.

I have testified before the Postal Rate Commission on numerous occasions. In Docket No. R94–1, I gave testimony before the Postal Rate Commission on the reclassification of Second-Class Within-County tallies for the In-Office Cost System (IOCS). In Docket No. MC95–1, I gave direct testimony on letter bundle handling productivities and the make-up of presorted First-Class Mail. I also gave rebuttal testimony on the savings from letter automation, the demand for greeting cards, and an analysis of qualifiers for the proposed Publications Service subclass. In Docket No. MC96–2, I gave testimony regarding corrections to Classroom Periodicals unit costs, the associated standard errors, and possible changes to the sampling system. In Docket No. R97–1, I gave testimony on the design of IOCS and its use to obtain volume-variable costs by subclass. That testimony introduced a new volume-variable cost methodology for mail processing Clerk and Mail Handler labor, cost segment 3.1. I also gave rebuttal testimony in Docket No. R97–1, addressing numerous issues including intervernor criticisms of the new methodology for mail processing labor costs. In the fall of 1998 I participated in the U.S. Postal Service-Industry Joint Study Team for Periodicals.

During my tenure at Christensen Associates, I have also worked on research assignments including productivity measurement in transportation industries and the U.S. Postal Service. I have provided litigation support and expert testimony for a number of clients on issues related to intellectual property, anti-trust, and contracts.

## I. PURPOSE AND SCOPE (GUIDE TO TESTIMONY AND DOCUMENTATION)

My testimony addresses Clerk and Mail Handler mail processing costs, and has two parts. Section II is an analysis of operational factors that determine the degree of volume-variability for mail processing costs, from which I conclude that volume-variability is less than 100 percent. Section III justifies some of the methods used to develop Base Year 1998 mail processing volume-variable costs by subclass from the In-Office Cost System (IOCS) data. In Section III, I discuss Library Reference LR–I–115, which is the only Library Reference directly associated with my testimony. I have no workpapers.

My analysis in Section II builds on the descriptions of mail processing operations in witness Kingsley's testimony (USPS–T–10). In Section II, I consider whether the structure of mail processing operations supports the assumption that mail processing costs are uniformly 100 percent volume-variable. I conclude that volume-variability factors are likely to differ across the various types of mail processing operations, and are likely to be less than 100 percent. I also discuss some intervenor and Commission criticisms of

Dr. Bradley's analysis from Docket No. R97–1 and evaluate the reasonableness of the estimated volume-variability factors produced by witness Bozzo (USPS–T–15) in the current filing.

In Section III of my testimony I address many of the criticisms that have been made by intervenors regarding the Postal Service's method of cost pool formation and creation of distribution keys to obtain volume-variable costs by subclass. These include, but are not limited to, the treatment of IOCS tallies associated with mixed-mail, non-identified containers, and "not-handling" observations. With respect to each criticism, I conclude the method proposed in the current docket by the Postal Service is preferred or that the change called for by the intervenors would be of little consequence. I also address several details of the mail processing volume-variable cost distribution method proposed by the Postal Service in this proceeding. Witness Van-Ty-Smith (USPS–T–17) describes the technical details of the Base Year 1998 volume-variable cost calculations for Cost Segment 3. The In-Office Cost System, on which the distribution keys are based, is described by witness Ramage (USPS–T–2).

Library Reference LR–I–115, 1995 Platform Study, reports the methodology of a survey conducted by Christensen Associates. The survey focused on the activities of clerks and mail handlers clocked into the MODS platform operations. I compare the results of that study to the subclass distribution from IOCS.

## II. VOLUME-VARIABILITY

### A. INTRODUCTION

The volume-variability factor (or simply "variability") is the percentage change in cost that results from a "small, sustained" (percentage) change in volume, holding delivery points and other non-volume factors constant.[1] In Docket No. R97–1, the Postal Service presented a comprehensive study of volume-variable mail processing costs.[2] The study used MODS and IOCS data to partition mail processing costs by operational activity and MODS and PIRS data to estimate variabilities econometrically. The study resulted in two major findings that differed from traditional assumptions: first, that variabilities differed significantly across activities; and second, that variabilities generally are less than 100 percent.[3] The Postal Rate Commission accepted the partitioning of clerk and mail handler mail processing costs into activity-based cost pools for purposes of distributing costs to subclasses, but continued to apply the assumption of 100 percent variabilities to each cost pool—contrary to the Postal Service's study results.

This testimony presents an operational approach to the study of volume-variable cost for mail processing operations. In Docket No. R97–1, witnesses sponsored by UPS and OCA challenged the Postal Service's estimated variabilities on several grounds, including the robustness of the regression results and the conceptual and operational bases of the models. The Commission cited the OCA and UPS criticisms, as well as the Postal Service's traditional description of mail processing as 100 percent volume variable, among its reasons for rejecting the Postal Service's estimated variabilities. This testimony addresses some of the fundamental operational issues that were largely unstated, but implicit, in the intervenor criticisms.

Setting the stage for the econometric models, I show that the structure of mail processing operations does not support the assumption that volume-

[1] For a discussion, see witness Bozzo's testimony, USPS–T–15, in this docket.

[2] Docket No. R97–1, USPS–T–12 [Degen], USPS–T–14 [Bradley].

[3] Docket No. R97–1, USPS–T–14 [Bradley], at 52–69.

variability factors should uniformly equal 100 percent. My analysis of the structure of mail processing operations also reveals that the pooled regression approach advocated by OCA witness Smith and the cross-sectional analysis favored by UPS witness Neels, in Docket No. R97–1, potentially ignores features of the Postal Service network and operations that are vital to distinguishing the cost effects of volume changes from the effects of non-volume factors. In fact, the Postal Service's econometric results are robust when compared across all models that properly reflect the structure of the Postal Service's network of mail processing operations. While my conclusion that volume-variabilities are generally less than 100 percent is derived by analyzing the structure of operations, econometric models consistent with the operational structure are needed to more precisely quantify the degree of volume-variability. The testimony of Dr. Bozzo describes the data and estimation methods used for the econometric models. I discuss the reasonableness of those results in the last part of my testimony.

I begin with "first principles" by examining the legislative basis for the use of marginal and incremental costs for Postal Service ratemaking in Section II.B. I use these concepts in Section II.C to analyze the Postal network and show how a small, sustained increase in national (RPW) mail volume causes widespread workload growth affecting most mail processing plants. I then analyze the characteristics of the plants of the distinct mail processing operations. I identify some of the local cost-causing characteristics that will not change in response to a small, sustained increase in volume. Some of these characteristics may appear to be volume-related but are, in fact, driven by non-volume factors, particularly those pertaining to the delivery network served by each plant. The confounding of volume and non-volume effects was the source of much of the controversy in the Docket No. R97–1 proceeding.

I continue with Section II.D where I examine the flow of mail within a plant and the component activities that make up the major mail processing operations. The Postal Service's traditional mail processing variability analysis assumed that mail-processing activities could be partitioned into those that are 100 percent "fixed" and those that are 100 percent volume-variable on the basis of IOCS information, which classified very few activities as "fixed." This simplistic model does not fit the complexities of real-world mail processing operations. Some component activities are seen to be highly volume-variable, others only partially volume-variable, and others potentially not volume-variable at all. This detailed operational analysis forms the basis for my conclusion that volume-variability factors differ across mail processing cost pools and cannot be assumed to be 100 percent.

Actual computation of volume-variable costs requires specific estimates of the volume-variability factors. To obtain them, the Postal Service relies on econometric models using MODS data, just as it did in Docket No. R97–1, as well as data from other sources. The econometric methods incorporate two important findings from my operational analysis:

1. Mail processing operations have cost-causing characteristics related to their location, service area, and role within the Postal Service's network that will not change as a result of a small, sustained increase in volume.
2. A small, sustained, and representative increase in national (RPW), all other factors remaining the same, volume will increase workload in all, or nearly all, plants.

These important operational findings should eliminate the confusion that was present in the Docket No. R97–1 proceeding, where the intervenors' analyses confounded non-volume effects with volume effects. Since there are significant non-volume, cost-causing characteristics, the econometric models must control for them by including specific measures of these characteristics or, if they cannot be measured, by using more general controls such as facility-specific "fixed effects." In the Docket No. R97–1 volume-variability analysis, the fixed-effects terms in Dr. Bradley's recommended model partially controlled for the effects of network variables, such as possible delivery points, and other factors that were not explicitly included in the models. As Dr. Bozzo's econometric results show, the failure to control for non-volume, cost-causing characteristics results in estimates of volume-variability that are biased upward.[4] Working from this conclusion, Dr. Bozzo's testimony demonstrates that all estimates derived from models that are consistent with the Postal Service's network and operation—*i.e.* that control for site-specific, non-volume, and cost-causing effects—yield consistent estimates of the volume-variability factors.

Finally, in Section II.E, I review the measured volume-variabilities estimated by Dr. Bozzo and find them consistent with my operational analysis. This study of the volume-variability of mail processing labor costs and the actual estimation done by Dr. Bozzo have produced results that reinforce Dr. Bradley's findings presented in the Docket No. R97–1 proceeding. Dr. Bozzo and I squarely address the Commission and intervenor criticisms regarding robustness raised in that docket, and provide a detailed description of the operational basis of the econometric models.[5]

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[4] The direction and magnitude of the bias is an empirical, rather than a theoretical, result. As Dr. Bozzo explains, nothing in the econometric methodology forces the variability estimates to be less than 100 percent.

[5] The Postal Service is not recommending the use of estimated variabilities for all cost pools. Measured variabilities are only used for operations for which piece volumes (total pieces fed, or TPF) is recorded in MODS. For a discussion of the status of the analysis for the other cost pools, see Dr. Bozzo's testimony, USPS–T–15, Section VIII.B.

## B. THE OBJECTIVES OF COSTING

### 1. The Institutional Framework

The Postal Reorganization Act requires the Postal Service to demonstrate that its proposed rates generate revenue for each subclass sufficient to cover its "attributable" costs and satisfy other criteria (39 USC § 3622(b)). The Postal Service addresses this obligation using a multi-step process. The process starts with the cost and revenue analysis (CRA) for a historical Base Year, some important results of which are estimates of unit volume-variable costs for the subclasses of mail and special services. The Postal Service then estimates changes in mail volumes between the Base Year and a future Test Year resulting from the proposed rate changes, and uses these, along with estimates of factor price inflation, expected savings from cost-reduction programs, and other anticipated changes, to project Test Year costs. The compliance of the proposed rates with the § 3622(b) criteria is determined with the projected Test Year costs.

### 2. The Theory

In Docket No. R97–1, the Postal Service presented theoretical testimony describing the methods needed to produce marginal and incremental costs from its Base Year and Test Year volume-variable cost analysis.[6] Witness Panzar testified that incremental costs are the appropriate economic cost measure to test for cross-subsidies in proposed rates, as required by § 3622(b)(3), while marginal costs are needed to evaluate the economic efficiency of proposed rates.[7] The Commission agreed in principle with witness Panzar that cross-subsidy concerns are most appropriately evaluated using incremental costs and

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[6] See Docket No. R97–1, USPS–T–11 [Panzar], USPS–RT–7 [Christensen].

[7] See Docket No. R97–1, USPS–T–11 [Panzar].

economic efficiency is most appropriately assessed with marginal costs.[8] The Postal Service's implementation of the marginal/incremental cost framework included a comprehensive econometric study of volume-variable mail processing labor costs.[9] The obligation to satisfy the requirements of § 3622(b)(3) using estimates of Test Year costs is an important use of product costing. Some of the controversy over economic cost concepts in Docket No. R97–1 resulted from confusion over the purposes of the Base Year and Test Year costs. For example, UPS witness Henderson argued that Postal Service rates should be based on mark-ups over incremental, rather than marginal costs, because the latter could not account for "changes in volumes, usage mixes, overtime rates, input costs, organizational changes, productivity improvements, general inflation, and other factors."[10] Such changes, to the extent that they can be forecasted, are more appropriately handled in the rollforward model. Base Year costs are only the first of two steps in the development of Test Year marginal costs.

In Docket No. R97–1, Postal Service witnesses Panzar and Christensen showed that econometric volume-variability factors and subclass distribution keys based on IOCS data can be combined to produce economically meaningful product costs (unit volume-variable or marginal costs). However, these presentations did not explicitly address the equally important question of the theoretical roles that the Base Year CRA and the roll-forward model play in estimating Test Year costs. The process can be understood as follows. The Base Year CRA yields subclass marginal costs that prevail in the Base Year, given Base Year operating procedures and constraints. The roll-forward model captures the cost effects of operational changes and adjustments between the

[8] See PRC Op., Docket No. R97–1, Vol. 1, at 231.

[9] See Docket No. R97–1, USPS–T–14 [Bradley].

[10] Docket No. R97-1, Tr. 25/13559.

Base Year and Test Year, as well as the cost effects of volume changes resulting from the proposed rates, among other factors. The effect of this division is to isolate the projections of the Test Year analysis from the empirical estimation of Base Year marginal costs.

The cost reduction possibilities over the prospective "rate cycle," which some intervenor witnesses and the Commission argued should be reflected in the Base Year volume-variability factors,[11] are logically part of the roll-forward model. While it would not be wrong *per se* to combine the planned cost reductions over the rate cycle with the historical Base Year cost analysis, doing so muddles the process and makes it much more difficult to evaluate the forecast assumptions and expected changes in the operating plan. Econometric models are well-suited to measuring expected changes in cost as volume changes, but are ill-suited for predicting changes in the underlying technology.

## C. THE POSTAL SERVICE MAIL PROCESSING NETWORK

### 1. ZIP Codes

The U.S. Postal Service serves every address[12] in the United States. To facilitate mail sortation, the Postal Service undertook the Zone Improvement Plan (ZIP) in 1963. The country was partitioned into areas generally corresponding to the service territories of post offices, stations, and branches, each identified by a 5-digit numeric code.[13] The Postal Service processing and delivery networks are defined in terms of ZIP Codes. Outgoing mail is sorted to the rest of the country using ranges of 3-digit ZIP Codes. ZIP Codes are hierarchical, *i.e.* all 5-digit ZIP

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[11] Docket No. R97–1, PRC Op. At 65–67, 72–73, 79–81; Tr. 28/15591–2 and 15840–1, Tr. 25/13559–60.

[12] Some "addresses" are the free Post Office boxes when to-the-house delivery is not provided.

[13] Stations and branches sometimes serve two or more 5-digit ZIP Codes.

Codes with the same first three digits combine to form a 3-digit ZIP Code area. The hierarchical relationship between 3-digit and 5-digit ZIP Codes facilitates sortation of mail without having to train mail handlers and clerks in memory intensive schemes. The service territories of mail processing plants typically comprise one or more 3-digit ZIP Codes.

The Postal Service extended the use of ZIP Codes to facilitate its automation plan. In 1983, the Postal Service introduced the 9-digit "ZIP+4" code to facilitate the sortation of mail to sector/segment (block face). Automated sortation of mail to carrier walk sequence was made possible by the creation of the 11-digit delivery point barcode, which is obtained by appending the last two digits of the address number to the 9-digit ZIP Code. The introduction of the delivery point barcode occurred in 1990.

**2. The Current Network**

The Postal Service connects over 30,000 post offices and other delivery units serving delivery points through a network of mail processing facilities. Most mail processing is done in large plants, but nearly all offices perform some sortation of the mail. Delivery units may be: *stations,* which are offices within the same city as the plant; *branches,* which are offices in adjacent cities but that report under the same finance number as the stations; or *associate offices,* which are post offices located outside the plant's city and report under their own individual finance numbers. In most stations, branches, and AOs, clerks and mail handlers record their workhours in the National Workhour. Reporting

System (NWRS) under Labor Distribution Codes (LDCs) 41–49.[14] The larger offices distinguish clerk and mailhandler mail processing hours in the plant from delivery unit sortation by recording the former under MODS codes that map into LDCs 11-19. Hence, mail processing hours are referred to as "Function 1" hours. All offices that record mail processing hours under Function 1 also report hours by the detailed 3-digit operational codes of the Management Operating Data System (MODS).[15] The only plants with Function 1 hours that do not report through MODS are Bulk Mail Centers (BMCs).[16] The BMCs use an hours and workload recording system analogous to MODS called the Productivity Information Reporting System (PIRS), which uses a set of 3-digit codes defined to reflect the specialized nature of BMC operations. In the discussion below, I describe operations as they would typically be found in non-BMC mail processing plants (*i.e.,* the operations in the Function 1 cost pools of cost segment 3.1).

Plants can play several roles in the Postal Service network. The most basic role for a plant is the sortation of incoming mail for one or more 3-digit ZIP Codes to the 5-digit ZIP Codes representing delivery units. Some plants serve more than one 3-digit ZIP Code. For example, a plant may serve the 3-digit ZIP Code for the city in which it is located and also one or more 3-digit ZIP Codes

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[14] The NWRS LDCs classify Postal Service work hours and compensation into broad functional categories. LDCs 41, 42, and 43 are, respectively, automated, mechanized, and manual sortation at delivery units; LDC 44 is sortation to P.O. boxes. LDC 45 is window service, LDC 48 is miscellaneous, and LDC 49 is CMV/CFS. LDCs 40–49, which encompass all activities at customer service facilities, are collectively known as "Function 4." See Library Reference LR–I–106 for complete details.

[15] Some stations and branches reporting Function 4 hours also report hours by 3-digit operational codes through MODS.

[16] Most Air Mail Centers and Facilities (AMC/AMFs) report data as part of the plant they serve, but some larger ones report as separate facilities. These "independent" Air Mail Centers report MODS data as part of regional transportation finance numbers.

representing associate offices outside the city. Plants generally further sort incoming letter mail for the stations, branches, and associate offices to delivery point sequence (DPS).[17] Flats and parcels are generally sorted to 5-digit ZIP Code, but some plants will sort flats (especially machineable flats) to the carrier routes for stations, branches, and associate offices. The sort plans are determined by the district, based on transportation dispatch times and clerk availability at stations, among other factors.

Plants do not have sufficient outgoing volumes to justify sort separations for every other plant in the country. As a result, some plants have been designated as Area Distribution Centers (ADCs) or Automated Area Distribution Centers (AADCs), which serve as intermediate transshipment and processing points for various sections of the network. Plants sort their outgoing mail to ADC/AADCs, and will add separations for other plants in their vicinity and their larger stations, branches, and AOs. Thus, ADC/AADCs receive mail from plants and mailers for 3-digit ZIP Codes for which other plants will perform the incoming sortation. The ADC/AADC will sort this mail among the other plants they serve as the ADC/AADC.

The 21 BMCs constitute a separate network of processing facilities specialized for Standard Mail (A and B), although they sometimes also act as hubs for Periodicals. BMCs sort incoming Standard Mail (A and B) parcels to 5-digit ZIP Codes for delivery units in their service territories, and outgoing parcels to other BMCs. The role of BMCs in processing non-parcel Standard Mail (A) varies, but it usually involves sack, tray, and bundle sorting and the cross-docking of pallets—*i.e.,* no piece sortation of letters and flats.

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[17] Letter mail for delivery units with small numbers of routes may be sorted only to 5-digit ZIP Code or carrier route because the volume for a small number of routes does not justify the capital expense required for automated DPS.

The nature and extent of the mail processing and distribution network, in particular the size and location of network nodes (plants), is driven substantially by non-volume considerations: the large proportion of each plant's mail that is local, the number and geographic dispersion of delivery units and delivery points, as well as the service standards for mail delivery. Additionally, the sheer volume of mail prevents the Postal Service from consolidating mail processing and distribution activities at a small number of large hubs. For these reasons, the geographic locations of mail processing facilities generally mirror the population (deliveries) distribution and ZIP Code structure, with plant size determined both by the number and types of delivery points being served as well as anticipated mail processing volumes.[18]

This is not to say that the Postal Service network is static. It has evolved over time as the nation has grown and its population distribution has changed, and as mail processing technology has progressed. It continues to evolve, albeit slowly. For example, between FY1993 and FY1996 (the R94–1 and R97–1 Base Years) the Postal Service added two new 3-digit ZIP Codes, in addition to the 912 in use previously.[19] During this same period it added five new mail processing plants[20]—averaging just over one new plant a year—each built to

[18] Other factors that may influence plant design and location include ease of access to transportation services, the availability of sufficient land at a reasonable price, and the presence of one or more large mailers.

[19] ZIP Code 608 (Chicago, IL) was added in 1995, and ZIP Code 341 (Ft. Myers, FL) was added in 1996. In addition to the 914 3-digit ZIP Codes currently used to partition service areas, ten are assigned to the IRS for receipt of tax returns and correspondence, five are assigned to individual firms, and one is reserved for processing International mail, for a total of 930. The remaining 70 possible 3-digit codes are not currently in use.

[20] These include: National Eagle Hub (Indianapolis, IN), Baltimore IMF/P&DC (Baltimore, MD), and Dulles IMF/P&DC/AMC/VMF (Dulles, VA) in FY93; Chicago North P&DC (Chicago, IL) in FY94; and the Northwest Boston P&DC (Waltham, MA) in FY96.

handle a portion of an existing plant's service territory. During this same period it also replaced 20 existing plants with new ones, and expanded or rehabilitated another three. One reason for this deliberate pace is the enormous time and capital commitments involved. From initial proposal to project completion, it may take anywhere from 6 to 9 years to bring a new plant on line. Site acquisition, planning, and approval for a new plant can easily take 5–7 years, and actual construction another 1–2 years.

### 3. National Volume Growth Affects Workload in the Entire Network

The geographic distribution of increases in national volume, and hence of volume-related workload growth, for mail processing plants, is a key element of my analysis of the relationship between mail processing labor costs and mail volumes. Nationally, the marginal impact of an increase in national mail volume may be assessed by introducing a hypothetical representative RPW piece into the mail processing network and observing the response of total clerk and mailhandler hours. Since the marginal piece is *representative* of all additional pieces, it does not have any particular origin or destination, but rather bears a positive *probability* of having any of the large number of conceivable origin-destination pairs that are possible in the network. Given this, and the fact that plants play multiple roles handling originating, destinating, and/or transit mail within the network, I must conclude that the additional volumes will cause workload growth throughout the network. To argue otherwise, one would have to imagine that incremental mail volumes would receive handlings in only a very few plants, which violates the representativeness of the marginal piece.

This point can be abstractly illustrated with a simple, stylized example. Consider a network with only three plants, in which each piece of mail receives exactly three handlings: an outgoing sort at its originating plant, an incoming sort at its destinating plant, and an intermediate platform handling that may occur at any one of the plants. Suppose that the probability that a representative additional mail piece receives a handling at any given plant is the same for each type of handling. These assumptions are summarized in Table 1.

**Table 1**
**Piece-Handling Probabilities**
**by Plant and Handling Type**

| Plant | Originating Sort | Platform Handling | Destinating Sort |
|---|---|---|---|
| 1 | 1/3 | 1/3 | 1/3 |
| 2 | 1/3 | 1/3 | 1/3 |
| 3 | 1/3 | 1/3 | 1/3 |

We are interested in finding the probability that a representative piece of additional mail will receive *at least one* handling at any given plant—say, plant 1. The probability in question can be shown, with a bit of arithmetic, to be 20/27, or just under three-fourths.[21] The point of this exercise is not to convince anyone that either the probabilities or the set-up itself are at all realistic—they are anything but that. Even though this hypothetical example was concocted for purely illustrative purposes, it is informative. It shows us that when a representative piece of mail has a positive probability of receiving each of its

[21] Let $A = \{\text{originating sort at plant 1}\}$, $B = \{\text{platform handling at plant 1}\}$ and $C = \{\text{destinating sort at plant 1}\}$. Then the probability of a representative additional piece receiving at least one handling at plant 1 equals $\Pr(A \cup B \cup C) = \Pr(A) + \Pr(B) + \Pr(C) - \Pr(A \cap B) - \Pr(A \cap C) - \Pr(B \cap C) + 2 \cdot \Pr(A \cap B \cap C)$, or $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}-\frac{1}{9}-\frac{1}{9}-\frac{1}{9}+\frac{2}{27}=\frac{20}{27}$.

handlings at *any* of the nodes on a network, the expected additional workload caused by an additional piece is necessarily dispersed throughout the network.[22]

This point seems to have been overlooked by some intervenors in the last rate hearing. For example, during oral cross-examination UPS witness Neels characterized the problem of a firm's response to volume growth in the following manner:

> If you have a need to increase output, you reach a certain point where you're operating one production facility at its most efficient level of activity, and what one should then do would be to replicate the facility elsewhere. That's why you see new factories being built when output increases, and I think that's a general response of any economic enterprise to an increase in volume.[23]

"Replicate the facility" in this context would not be a rational response to a volume increase with no changes to delivery points or other non-volume factors, unless the additional mail could be handled in a few geographically distinct facilities. The Postal Service could only handle additional volume by building new plants if nearly all the additional volume originated and destinated in a very small number of service areas. The decentralized, networked nature of the Postal Service's mail processing function, which is dictated by the population distribution, rules out plant replication as an option for handling the additional workload due to volume growth.

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[22] This conclusion is not an artifact of setting the probabilities of each type of handling be equal across plants in the previous hypothetical. For instance, if plant 1 originates the most mail, plant 2 is the main transit site, and plant 3 is the main destinating site, so that Table 1 looks like this:

| Plant | Originating Sort | Platform Handling | Destinating Sort |
|---|---|---|---|
| 1 | 1/2 | 1/6 | 1/3 |
| 2 | 1/3 | 1/2 | 1/6 |
| 3 | 1/6 | 1/3 | 1/2 |

then the probability of at least one handling at plant 1 is exactly three-fourths.

[23] Docket No. R97–1, Tr. 28/15791.

**4. Network and Location-Related Factors Affect Costs, But Do Not Change With Volume**

Operations in mail processing plants are grouped primarily by shape, technology, and the preferential/non-preferential status of mail classes. Given the range of shapes, and service standards [24] of the mail, the sort technology used to process any given mail piece depends primarily on the nature of the piece, the available equipment, and the processing window.[25] Therefore, the costs of a mail processing operation in a given plant depend on:

- Volume (pieces handled) in the operation
- Characteristics of the pieces (in some operations)
- Nature of the sort scheme
- Processing windows (in some operations)
- Configuration of the plant
- Available equipment (in some operations)
- Effectiveness of the labor force
- Variations in local work rules
- Effectiveness of management

I will now discuss how each of these characteristics affects costs and varies across plants.

The volume and mix of mail at each plant is determined largely by the number and characteristics of the mailers located in the plant's service territory, the quantity of mail received by addressees in the plant's service territory, and the plant's network status, such as whether or not it is an ADC or AADC.

[24] Pref and nonpref mail are not always segregated, especially in incoming secondary and tertiary distribution.

[25] The term processing window refers to the amount of time between acceptance/arrival of mail and the dispatch time required to meet delivery service standards.

Similarly, the distribution of shape, class mix, and other piece characteristics is beyond the control of plant management—it is determined by mailers and the location of the recipients.

Some mail pieces can be considered relatively homogeneous within certain mail processing operations. For example, all letter mail being processed on a barcode sorter must have a legible barcode, whether it was applied by the mailer prior to entry or by the Postal Service in an earlier processing step. Still, mail piece characteristics do affect the costs of some mail processing operations. For example, the flimsiness or rigidity of letter mail has a large impact on the productivity of automation operations. Similarly, the proportion of machine-printed, as opposed to handwritten, addresses has a significant impact on the reject rate, and hence the productivity, of running letter mail through an OCR.[26]

The sort plan affects costs in many ways. Where volume warrants, large firms and box sections may have unique 5-digit ZIP Codes. Manual sortation from 5-digit ZIP Code to carrier route is simpler with fewer routes per ZIP Code. If a plant serves only one 3-digit ZIP Code, then no ADC scheme is required because no sortation among different 3-digit ZIP Codes is required. Plants servicing large numbers of small delivery units (stations, branches, and associate offices) with small volumes must set up equipment with small volumes per separation.

The processing window influences costs because it affects the mix among operations. For example, volumes that are automation-compatible may have to be diverted to manual sortation if there isn't sufficient equipment available to

[26] While the cost of a rejected piece handling is basically the same as a successful piece handling in the OCR operation. Productivity measured as the number of barcodes successfully applied per hour, is lower the higher the reject rate.

process the remaining volume in the available time.[27] Longer processing windows also allow more mail to use time-intensive processing options, such as remote encoding. Non-barcoded volumes that arrive late in the processing window may have to be sorted manually if the Remote Encoding Center turnaround time is longer than the remaining processing window. This, in turn, requires that "backstop" operations (*e.g.,* manual) have some staffing independent of volume to ensure that service standards are met.

Plant configuration affects costs, either in the plant overall or in specific operations, in at least two ways: by affecting the logistics of moving mail through the plant each day, and by imposing limitations on equipment deployment. One of the most obvious examples of the impact of plant configuration on costs occurs at multi-floor mail processing plants, where elevators and/or conveyors are needed to move the mail between floors. Even in single floor plants, however, plant layout affects costs by determining the amount of labor required to move mail from operation to operation, or by limiting the number of containers that can be moved at one time by a tow motor. The number of dock doors and the dock configuration also can constrain movement of mail within the facility. Too few dock doors means increased congestion as mail for multiple trucks is staged at a single door. Too few dock doors also increases the need for staff, so trucks can be loaded and unloaded more quickly. Some dock doors may receive incoming or outgoing trucks only; doors receiving both types may be more congested. Equipment availability and capability determines the mix of operations used to process the mail and, consequently, determines the kind of mail that is processed in non-automated operations. This is especially true for flat mail.

[27] See Docket No. R97–1, USPS–T–4 [Moden], at 21.

The skill level and discretionary effort of the labor force and supervisors are determinants of productivity in all operations, although they tend to have the greatest impact in operations that are not machine-paced and/or require scheme knowledge, such as manual secondary sortation and the allied operations.

There is substantial variation in local work rules that can affect costs in specific operations as well as the plant as a whole. These include local rules or practices with respect to the scope of crafts for work assignments, extra time to wash-up after certain operations, and break time. An example of a local scope rule would be whether or not clerks are contractually allowed to operate equipment to move pallets into a bundle sorting operation. If local rules require that only mail handlers operate equipment for moving containerized mail, the bundle sorting operation would need to be staffed with mail handlers to operate forklifts or pallet jacks to move pallets as needed. If mail handlers were not readily available, clerks working the bundle sorting operation would be idle while waiting for the next pallet. Local labor agreements sometimes supplement national contracts by allowing additional clean-up time for employees working in specific operations, or additional time to walk to break areas when they are not conveniently located relative to work areas.

Finally, management's effectiveness at motivating workers and staffing to workload affects costs in all operations. Good supervision and motivation of craft employees affect productivity in both manual and automated operations. In manual operations, it is important to motivate workers since the operations are not machine paced. In automated operations, operators must correctly identify compatible mail to ensure it is processed efficiently while minimizing jams. Operators must also clear jams quickly when they do occur. Failure to do so leaves the entire machine crew idle. Management also plays a key role in staffing for expected workload. Managers perceive a trade-off between cost and service. Leaner staffing means lower costs, but may also mean more service failures. There is variation across plants in the frequency and magnitude of deviations of actual from expected workload. There are also differences in how well managers plan for and adapt to those deviations.

Plants in large urban areas tend to be less efficient than smaller plants, as measured by average pieces handled per hour. While not uniformly true, there is enough of a pattern that it could be incorrectly inferred that mail processing operations exhibit diseconomies of scale or density (i.e., that variabilities are greater than 100 percent).[28] In fact, this phenomenon is best understood in terms of the network-related and location-related cost-causing factors listed above, rather than volume *per se*. For instance, scheme complexity is greatest in large urban areas with the largest numbers of stops per route and the most routes per ZIP Code.[29] Large urban areas are more likely to have their "local" mail spread across several 3-digit ZIP Codes.

Likewise, narrow processing windows can be highly constraining in large urban areas because of the large number of delivery points being served and the peaking problems associated with the near-simultaneous dispatches to the city stations and branches. This means that more equipment is needed and will be run in shorter timeframes. It may also mean that more manual sortation is required as a backstop. Similarly, the scarcity of large building sites and high land prices in large urban areas require plants to be in less efficient multi-story

[28] This has been called "diseconomies of scale" (*cf.* Docket No. R97–1, Tr. 11/5521–30), but since all non-volume factors, including the mail processing and delivery networks, are properly held constant in the volume-variability analysis, volume-variability exceeding 100 percent would be more appropriately termed diseconomies of *density*.

[29] In Manhattan, many routes require multiple carriers per route—if the routes were configured for single carriers there would simply be too many routes for the manual incoming secondary schemes, which must be memorized by clerks.

facilities. In some areas, logistical (and sometimes political) considerations often require centrally located plants with limited expansion and configuration options.

Finally, the skill mix and discretionary effort of the workforce may vary with the relative wage level being paid by a plant. Postal Service wages vary by craft, length of service, and job assignment, but within those dimensions they are uniform nationally.[30] This means that Postal Service wages are less competitive, relative to private sector wages, in high-cost areas, which also tend to be large urban areas. Similarly, management salaries, vary somewhat by size of plant, but do not include regional cost-of-living differentials. The resulting salary compression is more likely to result in inadequate compensation for management of large urban facilities. Talented managers of small plants could quite rationally choose not to advance to management of large urban plants because the additional compensation is not a sufficient incentive.

All of the network and location-related factors discussed above impact costs. These factors explain the substantial variation across plants in productivity by operational cost pool. Table 2 shows the substantial variation in productivity by cost pool in terms of the inter-quartile ranges. It was compiled from the raw MODS data supplied in Section 2 of Library Reference LR–I–107, associated with the testimony of Dr. Bozzo.

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[30] Only areas not contiguous to the continental U.S. are given wage premiums. These are known as Territorial Cost of Living Adjustments (TCOLAs).

**Table 2**
**Productivity Variation Among Plants, Quarter 4 FY98**
**(TPH/Hour from MODS)**

| Cost Pool | Median | Inter-Quartile Range |
|---|---|---|
| OCR | 4,442 | 2,271 |
| LSM | 1,114 | 448 |
| SPBS Other | 240 | 128 |
| SPBS Priority | 256 | 189 |
| Manual Flats | 485 | 306 |
| Manual Letters | 609 | 295 |
| Manual Parcels | 255 | 286 |
| Priority | 220 | 166 |
| Cancellations | 3,745 | 1,798 |
| All BCS | 7,297 | 2,748 |
| All FSM | 617 | 176 |

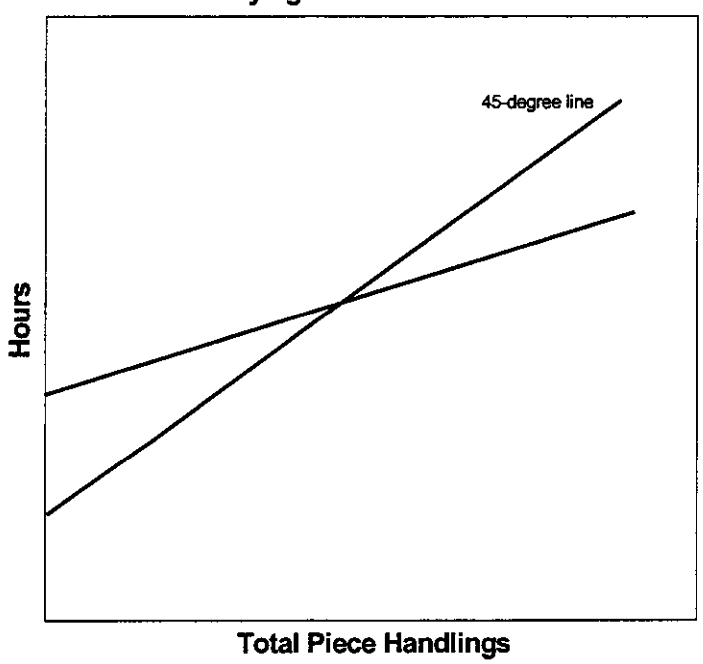
Dr. Bozzo's econometric labor demand models include variables to capture the effects of non-volume cost-causing factors. Their importance is confirmed by the statistical significance of the coefficients for site-specific control variables and non-volume workload indicators, as reported in his testimony.

### 5. Graphical Analysis of the Impact of Volume Growth

In questioning Dr. Bradley on his testimony in Docket No. R97–1, the Commission used a plot of TPH and hours from the manual letter cost pool to imply that visual inspection of the plot indicated 100 percent volume-variability for that cost pool. Dr. Bozzo thoroughly addresses the issue of graphical representation and analysis of the MODS data in his testimony, but I would also like to discuss it here because the pictures succinctly illustrate how ignoring non-volume characteristics of plants can lead to a biased, misleading understanding of the hours-volume relationship.

Naïve visual inspection of plotted hours against volume can result in the erroneous conclusion that hours will vary in direct proportion to volume when network and plant characteristics are ignored. I include Dr. Bozzo's plots that demonstrate this point using synthetic data generated from a cost structure of ten hypothetical plants, each with different non-volume cost-causing characteristics. Figure 1 shows the "true" cost structure of a mail processing operation for one of these hypothetical plants.[31] The volume-variability of the labor required in this operation at this hypothetical plant is less than 100 percent:[32] as volume in this operation increases at the plant, other factors held constant, hours increase less than proportionately.

**Figure 1**
**The Underlying Cost Structure for a Plant**




[31] By "true" or "underlying" cost structure I mean the systematic, non-stochastic component of the hours/pieces relationship.

[32] A 45-degree line is superimposed on Figure 1 for comparison.

Figure 2 shows simulated sample data generated by adding random noise to the underlying hours/pieces relationship plotted in Figure 1.

**Figure 2**
**Observable Data from the Underlying Cost Structure with Random Noise for One Plant**

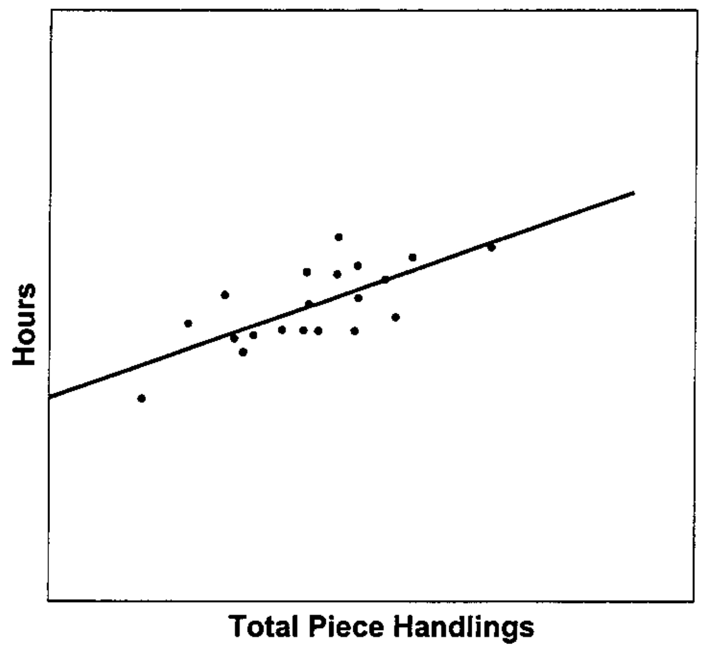
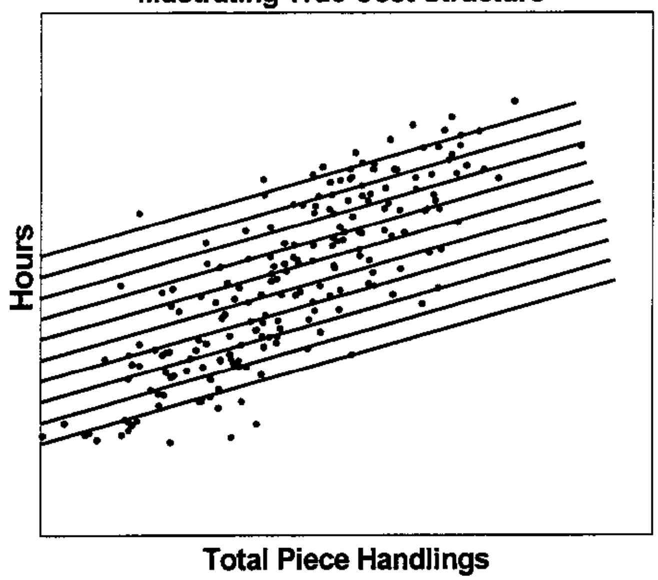


Figure 3 represents ten plants with similar cost structures, but different levels of efficiency. This situation is analogous to the Postal Service's network of plants, where the relative efficiency of plants is largely driven by non-volume factors.

**Figure 3**
**Data for Ten Plants with Similar Cost but Different Levels of Efficiency Illustrating True Cost Structure**



In Figure 4, the lines representing the true hours/pieces relationships are de-emphasized and an overall trend line is added. Without appropriate visual cues in the plot to indicate the correct relationship, the pooled data for all ten sites permit an erroneous conclusion that there is 100 percent volume-variability. Our eyes mis-identify the relationship because they cannot keep each plant's data separate; instead, we are deceived by the overall shape and orientation of the composite cluster of points. Since, in this example, larger-volume plants have higher costs independent of volume, the visually-fitted pooled regression line is overly steep, and leads to an overestimate of the true variability.

**Figure 4**
**Data for Ten Plants with Similar Cost Structures**
**but Different Levels of Efficiency**
**Illustrating Misinterpretation of Cost Structure**

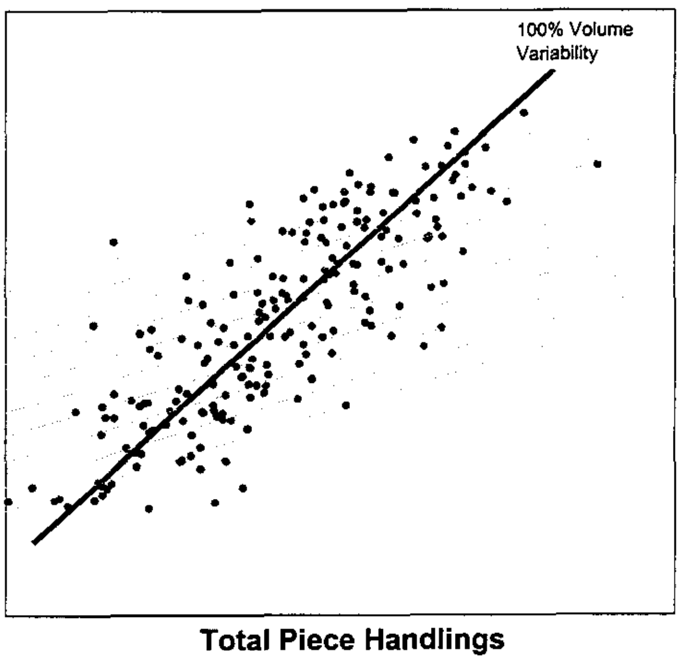
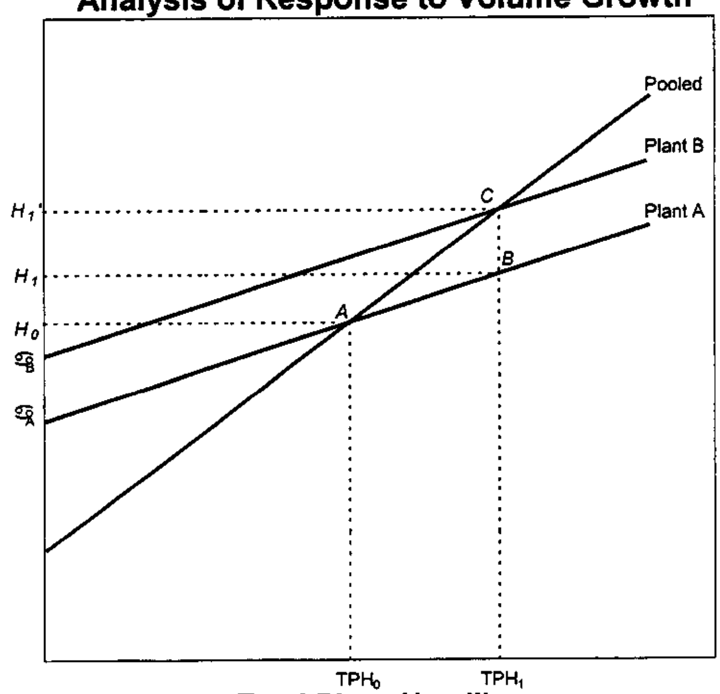


Figure 5 illustrates the fallacy implicit in the visually fitted line (Figure 4) by showing how the labor required in an operation at a specific plant responds to a volume increase, and contrasting that with the prediction of the visually fitted line. As volume in the hypothetical operation grows from $TPH_0$ to $TPH_1$ the required labor rises from $H_0$ to $H_1$—represented by the movement along the plant's expansion path from point *A* to point *B*. The visually fitted line, by contrast, predicts that as volume grows from $TPH_0$ to $TPH_1$ the labor required rises from $H_0$ to $H_1'$—represented by the movement from point *A* to point *C*. In effect, the visually fitted line presumes that plants change their non-volume characteristics since the line with the correct volume-variability, through point C has a higher interception ($\alpha_B$) than the correct line through point B (with intercept $\alpha_A$). Using the pooled variability from the visually fitted line would mean that a mail processing plant in Madison, Wisconsin would come to resemble the main Chicago plant with sufficient volume growth.

**Figure 5**
**Analysis of Response to Volume Growth**




**Total Piece Handlings**

## D. THE COST STRUCTURE

### 1. Plants

Operations within each mail processing plant are organized by activity and shape. Within each shape, operations are further organized by technology.

#### a) Acceptance and Collection

Mail enters each plant through the collection operation, the Business Mail Entry Unit (BMEU), and the platform (dock) operations. Collection mail is non-presorted mail picked up by carriers, deposited in collection boxes, or simply dropped off at Postal Service facilities. The BMEU accepts presorted and permit-imprint non-presorted mail. Collection mail and BMEU volumes are considered originating volumes. Mail that originated elsewhere, and is addressed to destinations in a plant's service territory, enters through the platform. Collection, BMEU, and platform activities handle all shapes of mail. The platform also handles all subclasses of mail, but collection is primarily single-piece First-Class Mail, and the BMEU is primarily presort from all classes. Collection mail goes through a culling operations where mail is separated by shape, class, and sometimes physical characteristics.

Permit-imprint, presort, and automation rate mailers are required to prepare their mail in packages, trays, sacks, and/or pallets, as specified in the Domestic Mail Manual (DMM). For each rate category, the DMM defines the package, sack, and/or pallet make-up requirements in terms of minimum volumes by ZIP Code, SCF, AADC, or ADC. The DMM also specifies maximum package and item weight.

When a mailing is deposited with a BMEU or detached mail unit, or accepted at the platform as a drop shipment, only the portion of it destinating in the plant's service territory will actually be processed in that plant.[33] Presort volumes that destinate elsewhere will be cross-docked, or sorted in items to containers for outbound transportation. The cross-docking of mail will be handled by workers clocked into the platform operation.

**b) Allied Labor**

Mail from the "rest of the world" for a plant's service territory arrives on in-bound transportation. Any incoming items or containers with contents that do not require further processing are staged for dispatch to the AOs, stations, and branches. Containers that require processing are worked in a set of operations called the "opening" unit. Most plants maintain separate opening units for preferential and non-preferential mail. The preferential mailstream generally includes First-Class Mail and Periodicals. There are sometimes separate opening operations for trays, sacks, and pallets.

From the opening units, some volumes flow directly to piece sortation and other volumes flow to bundle sort operations called "pouching." Bundle sortation sometimes occurs as part of the opening unit. Bundles of letters were substantially reduced with the implementation of the Docket No. MC95-1 classification reform.[34] Pieces flow directly to piece sortation operations. Piece sortation is done on the barcode readers, the optical character readers, and at manual cases.

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[33] Each plant will also process residual mail that did not have sufficient volumes by ZIP Code to require presortation.

[34] Bundles of letters are found in collection mail, but such bundles are not the result of presortation. These bundles are created by the mailers for their own convenience and are opened as part of cancellation operations.

A large proportion of flats are presorted in mailer-prepared bundles. The bundle sorting operations may be mechanized (Small Parcel and Bundle Sorter, SPBS) or manual. Under Postal Service operating plans, some bundles (carrier route and some 5-digit) may be kept intact, and others (ADC, 3-digit and other 5-digit) will be opened and the pieces will be sorted individually. Piece sortation of flats is done on Flat Sorting Machines (FSM) or manually in the plant, or manually in the delivery unit (secondary sortation only).

Operations that do not involve individual piece sortation are collectively called allied operations. Allied operations include the platform, opening, and pouching units. Allied operations do not generally involve handling individual pieces. Rather, mail is generally handled in items (trays, tubs, bundles, sacks, and pallets) and containers (rolling stock), though containers may sometimes contain loose pieces, from broken or spilled items.

**c) Piece Sortation of Letters**

The standard operating plan for letter sortation starts in cancellation. The culling activity identifies automation incompatible letters such as oversized letters (including too thick or lumpy) that are separately cancelled and sent to manual letter sorting operations. The AFCS then separates automation compatible letters into three streams: pre-barcoded letters (identified by the presence of a facing identification mark, FIM), enriched (typed) letters, and all other (usually script) letters.[35] Pre-barcoded letters are sent directly to BCS operations for sortation. Typed letters are usually sent to the OCR to be barcoded. For script letters, the AFCS, functioning as a Remote Barcode System Input Subsystem

[35] At some sites the AFCS does not distinguish enriched letters from all others.

(ISS),[36] creates an image of the address area on the envelope's face, and sends it to the Remote Computer Reader (RCR). The OCR functioning as the ISS will also send images of pieces it cannot resolve to the RCR.

The ISS puts an ID tag on the back of each piece, which is used to match the piece with its barcode data. When the image is sent to the RCR, the RCR attempts to assign the barcode automatically.[37] If the RCR cannot resolve the address, then the image is transmitted to a remote encoding center (REC). At the REC, a clerk will view the image on a computer screen and manually key the address information. For pieces that are resolved by the RCR or at a REC, the barcode is applied by a BCS operating as an output subsystem (OSS). The BCS-OSS reads the ID tag on the back of the piece, sprays the barcode on the front of the piece, obtains the corresponding barcode data, and then verifies the barcode and sorts the piece.

If the OSS cannot verify the barcode, it usually means that there was interference in the barcode clear zone on the front of the piece. In those cases, the mail pieces are run through the letter mail labeling machine (LMLM), where a blank white sticker is applied over the barcode clear zone. The pieces are then fed into the OSS again and a readable barcode is applied. The system applies barcodes to the level needed to sort the piece for delivery (which may only be 5-digit or 9-digit ZIP Code), or the system does the best it can given the address. Letters for addresses outside the plant's service territory are sorted to neighboring plants and AADCs or ADCs, then dispatched in trays. Subsequent

[36] Until recently the script letters would have been processed on the OCR-ISS for the image lift. Prior to the creation of the remote encoding centers, the script letters would have been processed on the LSM.

[37] The RCR is allowed more time relative to the OCR to process the image. The RCR employs algorithms designed to read mail with handwritten addresses.

sortation of barcoded letter mail destinating in the plant's service territory is done in BCS operations; some in plants and some in delivery units.

There are very few Letter Sorting Machines (LSMs) still operating. When they are used, some automation incompatible mail goes to the LSMs directly from cancellation. Before remote encoding, most script mail went directly to the LSM from cancellation operations.

The above description of letter mail processing was for collection letters. Letter mail from the BMEU, which is mostly presorted, is presented in mailer-prepared trays. BMEU letters that do not destinate in the accepting plant's service territory will be sorted by tray if possible. Otherwise the mail is sent to the OCR and BCS operations. Local BMEU letters (that destinate in its plant's service territory) will also be sorted in OCR and BCS operations, just like collection letters. There generally won't be many handwritten addresses mail among the non-barcoded BMEU letters, but there may be some addresses that the OCR reader cannot interpret. Letters from the rest of the world that destinate in a plant's service territory will arrive in trays and be designated as barcoded or manual. The operating plan calls for automation-compatible, non-presorted letters to be barcoded at the origin plant, so only incoming presorted non-barcoded letters need OCR-ISS processing at the destinating plant. Predominantly, plants sort to delivery sequence on DBCSs. Sometimes the delivery point sequencing of automation mail is done in larger delivery units using carrier sequence barcode sorters (CSBCSs).

The manual sortation of letters to delivery unit (incoming primary) is done at the plants. Local practices vary with respect to manual sortation to carrier routes (incoming secondary). Sometimes the plants will perform the manual incoming secondary sortation—sometimes it will be done in the delivery units.

**d) Piece Sortation of Flats**

Flats are sorted in manual operations and using machines. The model 881 was the first multi-position flat sorting machine (FSM) deployed. The FSM 881 sorts flat-sized envelopes, catalogs, and magazines including those with polywrap that is not too slippery and does not extend too far beyond the magazine itself. FSM 881s have four keying stations that have been retrofitted with barcode readers and optical character readers allowing automated sortation. The Postal Service has more recently deployed the FSM 1000, which can handle a broader range of physical characteristics than the FSM 881. The current deployment of FSM 1000 does not include optical character readers.[38]

The operating plan for processing flats varies widely across plants. Plants generally run First-Class flats on the FSMs—First-Class flats run very well on the FSM 881s. Some First-Class flats are sorted manually to meet service standards or because the physical characteristics of the piece require it. For Periodicals and Standard Mail (A) flats, the method of sortation depends on the available equipment, the volume of each class to be processed, the expected number of jams based on the piece characteristics, the available processing window, and service commitments. The method for determining whether flats will be sorted on the FSM 881, FSM 1000, or manually varies across plants. Some offices determine the piece sortation method as part of the bundle sorting process, other offices make that determination at the FSMs, while others operate flat "triage" operations that separate the mail flows to each type of FSM and to manual. Local management is responsible for determining the most effective method of identifying automation compatibility within individual plants. Flats are only sorted to carrier route in mail processing operations. Automated sortation to walk

[38] Deployment of optical character readers for the FSM 1000 is being explored, but would occur after the test year.

sequence is still in the planning stage. Manual secondary sortation may be done in the plant or in the delivery unit.

**e) Parcel Sortation**

In contrast to letter and flat sorting, which is mostly performed in plants, most primary parcel sortation occurs in BMCs. The BMC uses its parcel sorting machine to sort parcels to 5-digit ZIP Code for plants in its service territory, and to BMCs for the rest of the world. Non-machineable parcels are sorted manually at the BMCs to 3-digit ZIP Codes. Containers for individual 5-digit ZIP Codes or other BMCs are simply cross-docked and BMC-prepared sacks of parcels for 5-digit ZIP Codes are sorted, and then both are dispatched to the delivery units. Plants sort incoming large and odd shaped parcels referred to as non-machineable outsides (NMOs) and sacks to the delivery unit.

**2. MODS Cost Pools**

All operations within each mail processing plant are assigned standard 3-digit codes in the Management Operating Data System (MODS). MODS codes are specific to activity. For sortation operations, there are individual MODS codes by shape, type of equipment, and scheme. The individual MODS codes are too detailed for our analysis. We are concerned that workers may not reclock operations as schemes change on particular machines. Plants have some flexibility in how individual MODS codes are used. Therefore, the cost pools consist of groupings of related MODS operation numbers that preserve shape and manual versus mechanized/automated processing. At this level of aggregation we have reliable data that can be compared across plants.

**a) Cancellation**

The cancellation cost pool includes the culling and canceling operations. The activity begins with unloading the trucks and moving the mail to the culling operation feeders. Express Mail, Priority Mail, and other parcels that can be identified in the hampers are removed. Meter mail is identified where possible, and sent directly to the OCRs.[39] After the initial cull of the hamper, the container dumper spills the mail onto the culling belt.

The culling belt is staffed by clerks who open bundles; separate flats; cull small parcels, odd shapes, Express Mail, and Priority Mail; and identify bundles of meter letters that are trayed and sent directly to the OCR. Flats are usually cancelled by hand or using a simple belt-fed canceling machine. Parcels are hand cancelled. The staffing on the culling belt varies by time of day and by plant. Most plants plan to have all cancellation complete by 8 or 9 PM so that outgoing mail can be sorted in time to meet outbound transportation, which generally departs between 11 PM and 12 AM.

The culling operation is a "gateway" operation that must process collection mail quickly so that it can flow to the outgoing sortation operations. As collection volumes arrive at the plant, the cancellation operation determines the sortation window. It is critical that the cancellation operation be fully staffed early and late in the operation. Early in the operation, as collection mail arrives, inventories of mail must accumulate quickly at downstream operations, to ensure no interruption due to inadequate mail supply. Late in the operation, cancellation must be staffed to quickly clear any late arriving volumes. Increases in total collection volume that exhibit the current time distribution will not increase cancellation hours proportionately because the full staffing early and late in the operation will not need to change—some of the waiting time will simply be converted to processing time.

[39] When outgoing mail operations commence, between 4 PM and 6 PM, extra effort is made to identify metered mail so that the OCRs have mail to begin processing. This creates a wider processing window.

The dock/dumping activity must be staffed to help unload collection mail as it arrives. The same people who unload the collection vehicles may also be responsible for culling parcels, flats, and metered letters directly from the containers. The dock/dumping function is staffed as a gateway within the cancellation operation and can absorb additional volumes without a proportional increase in hours. The culling belt can be staffed to match expected mail volumes, but it will generally be staffed more heavily early in the window to quickly feed mail to the OCRs. Once sufficient volumes have been cancelled to create backlogs for the OCRs, the staffing can be adjusted to actual volume. At startup and wind down there will be some capacity to absorb additional volumes. The overall volume-variability of the cancellation operation will tend to be less than 100 percent because of its role as a gateway with varying vehicle arrival times and volumes of collection mail that cannot be forecast with certainty.

**b) Barcode Sorters**

Barcode sorters process letter mail by reading the POSTNET barcode that appears in the address block or on the bottom, right-hand corner of the front of the envelope. The barcode may have been applied by the mailer, the office in which the barcode sorter is located, or another mail processing plant. The staffing of a BCS consists of a feeder and a sweeper. The feeder takes mail from trays and sets it on the input ledge. Most BCSs are configured with sweep-side racks that hold trays corresponding to the output bins. The sweeper is responsible for filling the racks with trays and labeling each tray when the operation is first set up. At dispatch time all trays with mail are taken away—even partial trays. The sweeper monitors the output bins while the machine is in operation and removes the mail as the bins get full, placing the mail in trays. The sweeper places full trays in rolling containers or on a conveyor for movement to the next operation or dispatch. The sweeper then labels an empty tray and replaces it. Some offices use automated take-away systems that utilize tray barcodes to route the trays.

The pace of the BCS operations is determined by machine capabilities and the flow of mail to the operation. The BCS has a maximum throughput of 35,000 to 40,000 pieces fed per hour, depending on the type of BCS equipment used. Infrequent jams or machine breakdowns are the only reason that the BCS should be stopped during a run. The machines will also be stopped for scheme changes.

Barcode sorters have minimal setup time. Because the bins on the BCS can hold about 1.5 feet of mail, the sweeper can set up the racks of trays while the machine is running. The loader turns on the machine, selects the scheme, and begins feeding it mail. Loaders rarely have to stop the machine for lack of mail. The machine's run time should vary closely with the number of pieces fed. However, the operation includes a small amount of setup and takedown work that will not be volume-variable. The takedown work for the sweeper, for instance, will depend more on the number of output bins than the volume of mail in the bins at the end of each run. I would expect a relatively high volume-variability factor for BCS operations, but not quite 100 percent due to short periods of down time during scheme changes and dispatches.

**c) Optical Character Readers**

Like the barcode sorters, the OCRs are staffed with a feeder and sweeper. The machine sets the pace and only infrequent jams and equipment breakdowns interrupt a run. The feeder and sweeper function in the same roles as they do on the BCS. The feeder has the responsibility to identify letters that are not machineable.[40] These letters include ones that are too flimsy or that may have been damaged and will be worked in manual sortation. The identification of non-machineable letters begins in the culling operation, but the OCR feeder is the final screen.

OCR operations consist of activities generally similar to BCS operations. This would suggest that the OCR cost pool would have similar volume-variability. However, the OCR operations function as the gateway for non-barcoded letters. In order to meet outgoing dispatch times, the OCRs may be started and staffed with a feeder and sweeper before an ample backlog of mail is available to ensure uninterrupted operation. The OCRs may start and stop early in the evening as collection volumes ramp up. For this reason, I would expect the OCR volume-variability to be relatively high, but less than the BCS.

**d) Remote Encoding**

Remote encoding labor involves manually keying parts of the address so the OSS can apply the correct barcode. Staffing at the RECs consists largely of transitional clerks. These employees are scheduled such that a backlog of images is available. Although individual operators only key images for one plant at a time, most RECs process images from multiple plants. If the workload from one plant is light, employees may be switched over to key images for another plant. Since there are no other work functions performed at RECs and because the workforce is largely transitional, management has the flexibility to send employees home if there is not enough work to keep them occupied. With substantial staffing flexibility, a backlog of images to process, and minimal set-up and take-down costs, I would expect volume-variability to be nearly 100 percent.

[40] Machineability is not a discrete choice. Marginally automation-compatible mail can physically be fed into machines, but increased jam rates reduce the cost effectiveness of automated sortation.

**e) Letter Sorting Machines**

Letter sorting machines mechanically sort letters. The full complement for an LSM is three feeders, twelve keyers, and three sweepers. The feeders place letters on a ledge from which a mechanical arm picks up pieces and places them in front of a keyer at a machine-determined pace. The keyer reads the address, and keys a code that determines into which of the LSM's 277 bins the letter will be dropped. The sweepers monitor the output bins and remove the letters as the bins fill. The letters are placed in trays that have been labeled and aligned on racks corresponding to the output bins. The keyers rotate with the feeders/sweepers to alleviate the strain associated with keying at the 50 to 60 letter-per-minute machine pace. LSMs have minimal set-up activities, but the sheer size of the crew means the initial start–up takes some coordination. We would, therefore, expect less than 100 percent volume-variability, but not substantially less. The Postal Service has largely phased out its LSM equipment.

**f) Manual Letter Sortation**

Letter sorting cases have 88 separations, but wings and dividers can be added to increase that number to 132. Most letter cases have open backs so they can be swept while mail is being cased. Many manual letter-sorting operations include sweepers and feeders. The larger the operation, the more likely it is to have feeders and sweepers. The feeders stage mail at each case and the sweepers pull sorted mail from the case and tray it.

Manual sortation operations are worker paced. Increased mail volumes create pressure to sort faster in order to meet dispatch requirements. Sweeping activity at the end of the operation is independent of volume—all separations must be swept. Manual sortation relies heavily on the discretionary effort of the employees and management attention. Manual sortation is a backstop operation in which automation rejects must be sorted in a timely manner to meet service commitments. For these reasons we would expect volume-variability to be less than 100 percent.

**g) Flat Sorting Machines**

FSMs sort flat-shaped mail. The full complement for an FSM is four keyers and one loader/sweeper on each side for a total of six workers. Sometimes FSMs are run with partial crews. The FSM 881 and 1000 currently do not have automatic feeding mechanisms, so the operation is worker-paced, with an upper bound set by the speed of the machine.[41] The loader/sweepers are responsible for facing loose flats on the ledges so keyers can place them for entry onto the belt. All FSMs have been upgraded with barcode readers. When the barcode readers are in use, the keyers simply set the flats in position, with sortation proceeding automatically. Otherwise, the keyers enter a code to determine the output bin. Most flats are presented to the Postal Service in bundles so loader/sweepers may have to open bundles as part of the loading activity, if the bundles have not been opened in an upstream operation. The loader/sweepers are also responsible for monitoring the output trays and removing full ones. Some FSMs have tray take-away systems that make the sweepers' job easier. Without the tray take-away system, sweepers manually remove trays and sort them to rolling containers for dispatch or movement to a secondary operation. The sweepers must label empty trays to replace full ones, and also clear jams when they occur.

FSMs have some set-up costs. Unlike the BCS and OCR, the FSM does not have an output bin, but rather outputs flats directly to trays. Thus, trays must be labeled and placed at every run-out before the machine begins operation.

[41] There are plans for automatic feeders for the AFSM 100.

FSMs are primarily used to sort First-Class Mail and Standard Mail (A). Classes of mail are not usually commingled prior to the incoming secondary sort so the FSM is frequently swept and then set up for each class. Since the FSM has higher set-up costs and is human-paced, the volume-variability of the operation would be expected to be lower than BCS.

### h) Manual Flat Sortation

Manual flat sortation is performed using a case with a varying number of separations. A standard flat case has 36 separations, but wings can be added to increase the total to 96. Manual flat sorters take flats from items and containers and sort them into the separations in the case. As with the FSM operation, sometimes the sorter must open the bundles that are staged at the case or in nearby rolling stock. Cases are swept by placing the flats in trays that are labeled to the destination. Some have open backs and can be swept during sortation, but most do not. The use of dedicated feeders and sweepers is rare in manual flat sortation relative to manual letter sortation. Cases are permanently labeled and require no set-up. Flats for manual sortation are staged near the cases and employees in the manual flat sortation are responsible for moving the mail to the case for sorting. Manual flat sortation is worker-paced and productivity depends on discretionary effort and management attention. Manual flat sortation functions partially as a backstop operation because rejects require timely processing. Also FSM capacity is sometimes insufficient to handle the unpredictable volume of machineable flats.

Increased manual volumes will not result in proportional increases in set up, mail movement, or sweeping activities, so volume-variability should be less than 100 percent. The fact that increased volumes create pressure to sort faster and the fact that manual flat sortation sometimes functions as a backstop for

FSMs means that volume-variability should be substantially less than 100 percent.

### i) Manual Parcel and Priority Mail Sortation

Outgoing parcels are sent to the BMC without any sortation. The incoming manual parcel operations in plants consist of locating equipment, setting up sacks and/or rolling stock, sorting parcels to the plant's delivery units, closing the sacks, and sorting the sacks to rolling stock for dispatch. Loose parcels, parcels in 5-digit sacks, NMOs, and First-Class odd shapes for the delivery units of the plant are sorted in manual parcel operations. Priority Mail is sorted in similar fashion to separate operations.

Manual parcel sortation is a low-volume operation. The set-up and take-down is largely independent of volume and is often a substantial part of the operation's workhours, depending on the number of separations and equipment availability. Set-up includes obtaining, staging, and placarding the equipment. Setting up to sort to a large number of small stations and branches requires more set-up and take-down time than setting up an operation to sort to a few large delivery units, because larger volume separation frequently use rolling stock rather than sacks. In total, volume-variability of manual parcel sortation should be substantially less than 100 percent, primarily because set-up and take-down time are substantial relative to time spent actually sorting the parcels.

### j) Small Parcel and Bundle Sorter—Priority and Other

The small parcel and bundle sorter (SPBS) is a machine with four to six keying stations.[42] The SPBS requires a sizeable crew, 10–12 employees, depending on local practice. Mail is fed to each keyer via a short belt onto which

[42] The SPBS cost pool also includes the small number of Linear Parcel Sorting Systems (LIPS) that have been deployed.

mail from pallets, sacks, and rolling stock is placed. In recent years, the Postal Service has deployed auto feeder systems for the SPBS that permit the machines to operate with fewer feeders. With the auto feed conveyor system, mail is dumped onto a central conveyor belt, which then automatically supplies the keying stations.

The SPBS sorts parcels and bundles when the keyers enter a numeric code—the first few digits of the ZIP Code for an outgoing scheme, the last three digits of the ZIP Code for an incoming primary scheme, and the route number for an incoming secondary scheme. The keyer may also enter a code indicating whether the pieces in the bundle are barcoded, and whether the pieces meet the local criteria for sortation on an FSM.[43]

The runouts of the SPBS are spaced so that walk-behind utility carts (WUKs) can be staged at each runout. In some offices, the parcels and bundles are sorted into these WUKs and then handled by sweepers who put the mail into rolling stock or gaylords. In some cases, sweepers perform additional sorts among the multiple containers staged at a single runout. In other cases, no additional sortation is performed. It is common for plants with numerous associate offices to use pouch racks (sacks hung from pipe racks) set up at one or two of the runouts so that the low volume of mail for small AOs does not use up valuable runouts.

Some plants have runout extenders that allow the mail to fall directly into hampers or gaylords. With the extenders, fewer sweepers are needed because the mail falls directly into its outbound container. In a plant that requires limited

[43] As discussed above, plants vary in their FSM capacity. Since the two FSM models differ in their capabilities, the available deployment of each model is a factor in setting criteria for which mail will be sent to the FSMs and which will be worked manually.

separations, some plants without extenders will use hampers or gaylords at the runouts with extenders, but each hamper or gaylord then uses two runouts and the possible number of separations is reduced.

The SPBS operation is operator paced. Jams are relatively infrequent. When WUKs are used at the runouts with sweepers removing mail manually, there are very few interruptions. When runouts are hampers and gaylords, the mail flow may be interrupted while containers are changed. The set-up and take-down time for the SPBS is substantial and varies with the availability of containers and the type of containers used at the runouts—sacks are more work to take down than hampers or gaylords.

Coordination of the 10-12 person crew adds to start-up time. Once the SPBS is in operation, workhours should vary closely with the number of bundles sorted. The overall degree of variability depends on length of run, *i.e.* the relationship between the fixed set-up and take-down time and the actual sorting time. I expect that overall SPBS volume-variability should be substantially less than 100 percent.

**k) Opening Units**

The opening unit has two parts: preferential (pref) and non-preferential (non-pref). Pref opening is primarily the sortation of trays of First-Class letters incoming from the rest of the world or outgoing to the rest of the world. The pref opening unit will also include trays (tubs) of First-Class flats and may also involve Priority sacks and trays. The non-pref opening unit involves the manual sortation and/or opening of sacks and bundles of Standard Mail (A).[44] Its name notwithstanding, the opening unit operation includes the sortation of outgoing trays into rolling stock for outbound transportation.

[44] These functions may also be performed at the SPBS, in which case the plant would have only limited opening unit (manual) operations.

Manual sortation of bundles from pallets and sacks is usually done into a "corral" of rolling stock and/or sacks. The size of the corral is determined by the number of separations the plant needs and the kind of containers used. The number of separations depends on the number of ADCs, 5-digit ZIP Codes, or zones, and the machineability distinctions that are being made such as manual, FSM 881, FSM 1000, and barcoded. The types of containers are determined by the average volume to each separation. Opening unit activities also include the sortation of flat trays from the FSM and manual operations into rolling stock for dispatch.

The opening unit operations have substantial set-up and take-down costs that will not vary with volume, but rather vary with the number of separations. Equipment availability varies across plants and the lack of equipment can increase set-up costs substantially. The congestion of the plant also determines the set-up and take-down times. The productivity of manual bundle sortion is directly affected by the number of sortations required and the physical configuration of the corral. A large number of sortions require more walking as opposed to pitching. The number of sortations will vary across plants. Large urban areas are likely to have a large number of delivery units and also use more separations for machineability due to the deployment of more FSMs and FSM types.

The volume-variability of opening units would tend to be low because of the substantial non-volume-variable costs of set-up and take-down. The way pallets are staged can also lead to lower volume-variability. Large urban offices are more likely to have union rules that require mailhandlers for staging mail into the opening unit, resulting in greater non-volume-variable costs.

### l) Pouching

The pouching operations involve the sortation of bundles or small parcels. The name "pouching" comes from the fact that the bundles and parcels are sometimes sorted to sacks. The sacks are used to hold the sorted mail for offices with relatively small volumes, such as associate offices. Large stations or branches would more likely be sorted into containers such as hampers, APCs, wiretainers, or gaylords.

Pouching operations consist of a configuration of sacks hung on a tiered pipe rack and other containers around a belt or container that is the source of mail to be sorted. One or more clerks pick up bundles or parcels and throw or carry them to the container for the office in which they will destinate. A configuration of larger containers allows more throwing. The smaller openings in sacks on a pipe rack require that the mail be thrown from a shorter distance or be placed directly into the sack. Productivity will be affected by the configuration required for each plant's service territory.

Employees clocked into pouching operations set up the operation, which means they locate, configure, and label the sacks or other containers into which the mail will be sorted. Platform workers or workers clocked into up-stream operations generally stage mail for the pouching operation in the area adjacent to the pouching operation. The workers in the pouching operation are generally responsible for obtaining mail from the staging area for sorting, though this is sometimes done by mail handlers. The movement of mail into pouching may involve moving a rolling container to the center of the configuration. For palletized mail it may involve using a pallet jack, although pallets are sometimes put on dollies. At some facilities, the pouching operation is configured around a belt and containers are dumped onto the belt. As the mail is sorted, some of the containers fill up and must be replaced. In the case of sacks, this happens frequently. With larger rolling containers it will happen less frequently. Workers clocked into the pouching operation are responsible for replacing full containers. Pouching operations are in many ways similar to opening units and sometimes have some overlap.

The time spent actually sorting the bundles can be expected to be proportional to the number of bundles. However, removal of full containers during sorting may not increase in proportion to sortation time, because most containers can absorb a small increase in volume. The movement of mail into the operation can also be expected to be less than 100 percent volume-variable because increases in volume will occur without proportional increases in the number of containers. Sortation time also depends on bundle characteristics (*e.g.,* weight, strapping quality), which can vary substantially. The initial set up of the operation, including the location and configuration of the equipment, and the final take-down would not be expected to vary with volume.

The overall volume-variability of pouching hours will depend on the relative proportions of time spent setting up and taking down the operation versus the time spent sorting mail. Facilities with SPBS have smaller volumes left for manual pouching. In an office with city zones and a separate scheme for associate offices, it would be common to see the city zones being worked on the SPBS and the associate offices worked in pouching because the SPBS would not have sufficient runouts for all the associate offices, and would require at least some manual sortation. Sortation to associate offices would also result in a higher proportion of set up costs because the mail volume to be sorted is relatively smaller. Like other manual operations, the worker pacing will cause reduced volume-variability. For these reasons, the volume-variability of pouching is likely to be substantially less than 100 percent.

**m) Platform**

The platform operation group covers a range of activities. Workers clocked into the platform are responsible for unloading inbound trucks (with the exception of some local collection runs, which may be unloaded by workers clocked into culling and cancellation), determining where the mail needs to be taken, moving the mail to staging areas in the plant, moving the mail between operations, moving the mail from the final sorting operation to the outbound dock, and loading outbound trucks.

Not all platform workers perform these functions. Some workers, such as tow motor drivers, are generally moving mail from and to the platform. Other workers are stationed primarily on the dock to load and unload trucks. Trucks have limited windows for loading and unloading in order to stay on schedule. The workers who unload and load trucks have some waiting time between trucks. Much of this time can be spent productively. The time between trucks is used to sort containers, stage mail to be taken into the plant, cross-dock pallets, and organize outbound containers. However, a portion of the waiting time is simply unavoidable. Since truck schedules are variable, the waiting time is necessary so the vehicles can be quickly loaded or unloaded.

The waiting time is not volume-variable. Increased volumes may cause increases in truck size, but it would not likely increase the number of trucks. Even if the number of trucks increased, the number of dock doors limits the number of crews needed. At some point, trucks are forced to queue-up and then overall waiting time by platform workers declines as a portion of the total.

The vehicle loading/unloading and container handling activities will also tend to be less than 100 percent volume-variable. The amount of time spent opening and closing trucks should be roughly proportional to the number of trucks. However, a one percent increase in mail volume would not cause a one percent increase in the number of inter-plant network trucks,[45] since the volume increase would be accommodated by running fuller or larger trucks. Similarly, a one percent volume increase will not generally result in a one-percent increase in containers in the network. Some of the additional volume would be accommodated by adding to existing containers that are not completely full because, for many separations, all the mail fits in a single container. Volume-variability in platform operations should be substantially less than 100 percent given that it consists almost entirely of activities that are less than 100 percent volume-variable. Platform operations are gateways and backstops that must be staffed for peaks, rather than average workload, creating spare capacity.

## E. REASONABLENESS OF THE ESTIMATED VOLUME-VARIABILITIES

After concluding, based on the above operational analysis, that volume-variabilities are generally less than 100 percent and that they vary across operations, still remaining is the task of obtaining point estimates that can be used to calculate volume-variable costs by cost pool. Dr. Bozzo's testimony reports the results of model estimation that yields the required point estimates for operations that report piece handlings. These are summarized in Table 3 along with total pieces fed, hours, and productivity by cost pool. In the following section I discuss those results vis-à-vis my operational analysis.

[45] The volume-variability of highway transportation costs, cost segment 14.1, is less than 82 percent for FY98. See Library Reference LR–I–3.

**Table 3**
**Point Estimates of Volume-Variabilities and Productivity Analysis by Cost Pool**

| Cost Pool | Estimated Variability (%) | FY98 | | |
|---|---|---|---|---|
| | | TPH(M) | Hours (M) | TPH/Hour |
| Manual–Letter | 73.5 | 45,983 | 60.472 | 760 |
| Manual–Flat | 77.2 | 8,133 | 17.803 | 457 |
| Manual–Parcel | 52.2 | 669 | 2.349 | 285 |
| Manual–Priority | 52.2 | 2,323 | 10.119 | 230 |
| | | | | |
| LSM | 95.4 | 2,805 | 2.631 | 1,066 |
| FSM | 81.7 | 21,229 | 34.642 | 613 |
| SPBS | 64.1 | 3,231 | 13.105 | 247 |
| | | | | |
| OCR | 75.1 | 33,543 | 8.602 | 3,900 |
| BCS | 89.5 | 272,627 | 41.575 | 6,557 |
| REC | 100.5 | 16,286 | 24.203 | 673 |
| | | | | |
| Cancellation | 54.9 | 40,785 | 11.954 | 3,412 |

**1. Manual Sortation**

The estimated volume-variabilities for all the manual cost pools are substantially less than one, as expected. The lowest estimate is for Priority Mail and parcels where the low volumes mean that set-up and take-down times are substantial portions of the total workhours. Manual letter and flat sortation have higher volume-variabilities reflecting their substantially larger volumes.

Manual flat sortation has slightly higher volume-variability than manual letter sortation. Manual flat sortation involves proportionately more production sortation as opposed to functioning as a backstop. This can be seen from the fact that the proportion of flats sorted manually is more than twice the share of letters sorted manually.[46] Relatively less of a backstop role for manual flat sortation means more time at full capacity and greater volume variability.

[46] Only 13 percent of letter TPH occur in manual sortation [from Table 3, 45,983/(45,983+2805+33,543+272,627)], but 28 percent of flat TPH occur in manual sortation [8,133/8,133+21,229].

Given my operational analysis, the estimated manual sortation volume-variabilities are in the correct range and ordered as expected.

**2. Mechanized Sortation**

The estimated LSM volume-variability is 95 percent, which is a little higher than I would have expected given its large crew size and role as a backstop operation. However, with LSMs all but phased out, the estimated volume-variability is of minimal consequence in calculating subclass costs.

For FSMs, the estimated volume-variability is less than one, but higher than any of the estimates for manual operations. The estimate is very reasonable given that it is worker-paced and the volume per run is much smaller than the automated letter operations. For the SPBS, the estimated volume-variability is the lowest among the mechanized operations. The volume of handlings is much smaller for the SPBS, so set-up and take-down result in total SPBS costs being substantially less volume-variable.

**3. Automated Operations**

The estimated volume-variabilities for automated operations are all above 75 percent. This is as expected. These are machine-paced, operations with small proportions of set-up and take-down time. The estimated OCR volume variability is the lowest, no doubt reflecting, the OCR's role as the gateway for non-barcoded letter mail. The BCS volume variability is almost 90 percent, the highest estimated volume variability except for Remote Encoding, for which the estimated variability is 100 percent. My operational analysis indicates that there are essentially no set-up and take-down costs for RECs. REC activities are closely monitored for productivity (though not machine-paced), and RECs have maximum scheduling flexibility. The magnitude and ordering of the automated volume-variabilities is fully consistent with my operational analysis.

**4. Cancellation**

The estimated volume variability of cancellation is only slightly higher than the estimate for manual parcels and Priority Mail. Cancellation is the epitome of a gateway operation. In order to make service commitments it is imperative that early arriving volumes are cancelled and fed to downstream operations quickly. At the other end of operation there must be the ability to handle late arriving volumes quickly and get them into down stream operations to meet dispatch times. The estimated variability may seem low, but it is wholly consistent with my operational analysis.

**5. Summary**

Dr. Bozzo's point estimates are very consistent with my operational analysis. Those operations with gateway or backstop roles have lower volume-variability. The operations that are machine paced have higher variability than those that are not.

I believe Dr. Bozzo's point estimates are robust in that all models that are consistent with the Postal Service's network structure and pattern of volume growth yield very similar results. My analysis indicates that mail processing volume-variability is less than 100 percent. I also believe Dr. Bozzo's are the best available point estimates, and that they are sufficiently accurate to use in computing Postal Service marginal costs.

# III. COST POOL AND DISTRIBUTION KEY ISSUES

## A. SO-CALLED "MIGRATED" COSTS ARE PROPERLY CLASSIFIED AS PART OF MAIL PROCESSING

Historically, clerk and mail handler costs, Cost segment 3, have been partitioned into mail processing, window service, and administrative components using IOCS data. In Docket No. R97–1, the Postal Service proposed the methodology be changed to use the MODS codes of the sampled employees to accomplish the partition. The Commission's cost method continues to employ the IOCS-based partition to apportion Cost segment 3 costs among its mail processing, window service, and administrative components.[47] The MODS-based partition I advocated in Docket No. R97–1 "migrated" costs from the administrative and window service components into the mail-processing component. While UPS witness Sellick generally supported the MODS-based cost partition, he considered it necessary to revert most "migrated" costs to the IOCS-based components to maintain traditional volume-variability assumptions.[48] Mr. Sellick did not otherwise claim to have considered the changes in cost classification on their merits.[49]

The Postal Service's MODS-based partition of clerk and mailhandler costs assigns $622.4 million of base-year "support" costs for miscellaneous and support operations to component 3.1 costs (of which $321 million is Function 1 support and $301.4 million is Function 4 support). The nature of these support activities involves little handling of mail; indeed, many of the work activities recorded in IOCS under question 18G traditionally have been classified as

[47] PRC Op., Docket No. R97–1, Vol. 1, at 126.

[48] Docket No. R97–1, Tr. 26/14171–72, 14183–89, Tr. 36/19487–90.

[49] *Ibid.*

administrative (Cost component 3.3) costs. In the traditional treatment of Cost component 3.3, most administrative costs are considered general overhead or support costs and are therefore piggybacked on a composite of field labor costs from Cost segments 2–12.

The traditional method has two main shortcomings. First, it assumes that mail processing support costs vary in proportion to labor costs from pools that are spread across 10 disparate cost segments. The recent Data Quality Study rightly questions the mechanical application of this method to the distribution of support costs in the absence of supporting evidence.[50] The second shortcoming is that the traditional method wrongly assumes that there is no information available to more narrowly identify the causes of these costs. Such information does exist, however, in the form of the MODS operations into which sampled employees are clocked. While the clocked operation generally does not identify the cost-causing activity with a particular cost pool, it does, nonetheless, associate the costs specifically with Function 1 or Function 4 operations, rather than broadly with all field operations together.[51]

These distinctions are important because volume-variabilities and cost distribution keys[52] vary widely across cost segments. Treating the "administrative" portion of the support cost pools as part of component 3.1 is a more accurate association of support costs with their causal factors. I therefore recommend that this change in cost classification be adopted. This change does, in my opinion, represent an improvement in the costing methodology

[50] *Data Quality Study, Technical Report #1: Economic Analysis of Data Quality Issues,* prepared by LINX, a division of A.T. Kearney, Inc. for the U.S. Postal Service, April 16, 1999, at 57–59, 67–68.

[51] *Ibid.*

[52] Cost distribution keys are the vectors of shares used to partition a pool's costs to subclass.

independent of the volume-variability method the Commission ultimately decides to apply to the Function 1 sortation operations. It is also a step towards grouping "all costs associated with an activity...to the activity cost pool," as advocated by the authors of the Data Quality Study report.[53]

**B. MODS MAIL PROCESSING SUPPORT COSTS SHOULD BE DISTRIBUTED TO SUBCLASS USING THE COSTS ASSOCIATED WITH THE ACTIVITIES BEING SUPPORTED**

The Postal Service's new distribution method for support costs resembles the historical method for general administrative costs rather than the historical method for other mail processing operations. I believe that it is appropriate to ignore the small fraction of direct tally data in the MODS Function 1 and Function 4 support cost pools and to distribute the volume-variable costs in those pools in proportion to the volume-variable costs in the supported operation groups. In the case of the Function 4 support operations, the supported activities include window service. The direct tally data represent actual handlings of mail by the sampled employees, but we believe these handlings are incidental to the support activities that constitute the bulk of the tallies in these cost pools, and, therefore, do not necessarily represent the true patterns of cost causation.

The proposed method for distributing Function 4 support costs addresses two major shortcomings of the Postal Service's R97–1 method for distributing the former LD48_Adm and LD48_Oth cost pools. First, it recognizes that costs in the former LD48_Adm cost pool, which Dr. Bradley assumed to be non-volume-variable, should be partly volume-variable. Second, it reflects the fact that the quasi-administrative Function 4 costs are driven by all Function 4 activities—including activities traditionally classified as mail processing and window service.

[53] *Data Quality Study, Technical Report #4: Alternative Approaches for Data Collection,* prepared by LINX, a division of A.T. Kearney, Inc. for the U.S. Postal Service, April 16, 1999, at 40.

Note that the migration of costs from Cost component 3.2 to Cost component 3.1 under the Postal Service's new method are mainly to other Function 4 operations, in particular Function 4 support. This means that costs "migrating" between the traditional mail processing and window service components are appropriately distributed. To the extent that the MODS-based partition provides a less clear distinction between the cost components, it is simply capturing the reality that mail processing and window service activities overlap in most delivery units.

## C. THE POSTAL SERVICE'S METHOD FROM DOCKET NO. R97–1 PROVIDES THE MOST ACCURATE ESTIMATES OF THE SUBCLASS DISTRIBUTION OF MIXED-MAIL OBSERVATIONS

Witnesses representing Periodicals mailers have been sharply critical of the Postal Service's treatment of mixed-mail tally costs for the past three rate cases, claiming that it unfairly burdens Periodicals mail, as well as much of Standard Mail (A), with mail processing costs that ought to be borne by other mail classes.[54] In this section of my testimony, I enumerate the key assumptions underlying the Postal Service's distribution of mixed-mail, empty item, and container tallies, and address the concerns articulated by these witnesses in previous dockets.

The key assumptions of the Postal Service's proposed Base Year CRA mail processing cost distribution methodology include:

1. The contents of items tallied as "mixed-mail" in IOCS have the same subclass distribution as direct item tallies of the same item type.

[54] Docket No. R90–1, Tr. 27/13276–334 and Tr. 37/20479–505 [Stralberg]. Docket No. R94–1, Tr. 15/7128–35 and Tr. 25/11818–906 [Stralberg], Tr. 26A/12352–66 [Cohen]. Docket No. R97–1, Tr. 26/13811–13980 and Tr. 36/19281–4, 19289–90, 19292 [Stralberg].

2. The costs associated with empty item tallies have the same subclass distribution as the costs associated with direct item tallies of the same item type.
3. The costs associated with non-identified container tallies have the same item distribution as the costs associated with identified container tallies of the same container type.
4. The costs associated with tallies of items in mixed-mail containers have the same subclass distribution as the costs associated with direct item tallies, by item type.
5. The costs associated with empty container tallies have the same subclass distribution as the costs associated with non-empty container tallies, calculated using assumption 4.

These assumptions are applied within cost pools, with the exception of platform containers (number 4) where the subclass distribution of the contents is imputed more broadly, using item tallies in all allied labor cost pools. Table 4 shows the dollar-weighted tallies associated with each of the above assumptions.

Assumption 1 involves non-empty item tallies, which represent only 1.1 percent of total costs. Past criticism of this assumption has focused on the possibility of data collector (or "selection") bias in the IOCS sampling rules. It has been argued that items containing certain subclasses (in general, workshared mail) are more likely to result in direct tallies than items containing other subclasses. Time Warner witness Stralberg has made this argument with respect to Periodicals, *i.e.* that Periodicals items are more likely to result in direct tallies than mixed-mail

**Table 4**
**Analysis of Y 1998 Mail Processing Handling Tally Costs**
**For MODS Offices Only**
**(dollar weighted, millions of dollars)**

| | Relevant Assumption | All Subclasses | % of Total Handling | Regular Rate Periodicals | % of Total Handling |
|---|---|---|---|---|---|
| Direct Pieces | | $3,353.53 | 58.8 | $126.98 | 44.6 |
| Items: | | | | | |
| Direct | | 1,029.53 | 18.1 | 75.44 | 26.5 |
| Mixed Non-Empty | 1 | 64.47 | 1.1 | 4.81 | 1.7 |
| Empty | 2 | 281.19 | 4.9 | 17.58 | 6.2 |
| Total Items | | 1,375.19 | 24.1 | 97.83 | 34.4 |
| Containers | | | | | |
| Direct | | 34.56 | 0.6 | 3.61 | 1.3 |
| Identified | 4 | 475.93 | 8.3 | 27.53 | 9.7 |
| Non-Identified | 3,4 | 19.89 | 0.3 | 1.25 | 0.4 |
| Empty | 5 | 444.53 | 7.8 | 27.22 | 9.6 |
| Total Containers | | 974.91 | 17.1 | 59.61 | 21.0 |
| Total Handling Mail | | 5,703.63 | 100.0 | 284.43 | 100.0 |

tallies.[55] Therefore, Mr. Stralberg claims, keys based on direct item tallies over-distribute mixed-mail item tallies to Periodicals.

The only definitive way to evaluate this criticism would be to undertake a study of the contents of mixed-mail items, and observe whether they actually contain relatively fewer Periodicals pieces than direct items. Performing such a study, however, would not be worthwhile. For 1998, only 25 percent of all item tallies (5,625 tallies out of a total of 22,404 total item records) were mixed-item

[55] Docket No. R97–1, Tr. 26/13827. Note that Mr. Stralberg makes two distinct claims. First, and probably more importantly overall, items containing Periodicals and Standard Mail (A) are more likely to constitute identical mail than all items. Tr. 26/13830. Second, non-identical items subject to counting (*i.e.*, sacks, parcel trays, con-cons, and pallets) containing Periodicals mail or parcels tend to be easier to count than all items subject to counting, and therefore IOCS data collectors, pressed for time to meet their quotas, tend to count them in favor of other items. Tr. 26/13831. See also Docket No. R94–1, Tr. 25/11849 [Stralberg] and Tr. 26A/12352–62 [Cohen].

tallies. Because mixed-item tallies occur unpredictably and relatively rarely, the cost of observing a sufficient number of tallies to meaningfully infer whether or not bias exists would be high. Even assuming that such a study could be done in a way that would produce meaningful results, the exercise would not be worthwhile because the tallies at issue constitute just 1.1 percent of total mail processing tallies that involve handling mail.

To illustrate why such a study would be unjustifiable, consider the following hypothetical case that maximizes any potential bias toward overstating the presence of Regular-Rate Periodicals in mixed-mail items—namely, taking the extreme position that there could be *no* Regular Rate Periodicals in mixed items at all. If, following witness Stralberg's advice, the Postal Service were then to distribute *none* of the costs associated with non-empty mixed-mail item tallies to Regular Rate Periodicals, this subclass's share of the costs associated with handling tallies would only change from 4.99 percent to 4.90 percent—a change of 0.09 percentage points—and this, again, based on the extreme assumption that none of the sampled non-empty, mixed items actually contained Regular-Rate Periodicals.

The assumption that no non-empty items that are observed as mixed-mail in IOCS actually contain Regular-Rate Periodicals is almost certainly unwarranted because nearly one-fourth of the non-empty, mixed-item tallies distributed to Regular-Rate Periodicals come from brown sacks, which have a very strong operational association with Regular-Rate Periodicals.[56] Table 5 shows the distribution of costs associated with non-empty, mixed-item tallies for Regular Rate Periodicals by item type.

[56] For FY98, 70 percent of direct brown sack tallies were identified with Regular-Rate Periodicals.

**Table 5**
**BY98 Distributed Non-Empty Mixed Item Tally Costs**
**Regular-Rate Periodicals by Item Type**
**MODS 1&2 Offices**
**(dollar-weighted, millions)**

| Item Type | Tally Dollars | Percent of Total |
|---|---|---|
| Bundles | $0.472 | 9.8 |
| Flat Trays | 0.350 | 7.3 |
| Letter Trays | 0.026 | 0.5 |
| Pallets | 0.819 | 17.0 |
| Brown Sacks | 1.174 | 24.4 |
| White #1 Sacks | 0.220 | 4.6 |
| White #2 Sacks | 0.795 | 16.5 |
| White #3 Sacks | 0.215 | 4.5 |
| Other Items | 0.737 | 15.3 |
| Total | 4.810 | 100.0 |

Assumption 2 involves empty item tallies, which represent 4.9 percent of the costs associated with handling tallies. While empty item tallies are frequently lumped, for purposes of discussion, with non-empty, mixed-item tallies, doing so greatly exaggerates the importance of any potential bias arising from the latter. There is no question of selection bias with respect to empty items: to my knowledge no one has argued that data collectors improperly identify empty items. The Postal Service distribution key methodology assumes that, by item type, observing an empty item gives the same information about the subclass distribution of the handlings as a non-empty mixed item. This is reasonable in light of the strong operational association between item type and subclass. To illustrate this point I have compiled Table 6, which classifies the empty-item tallies by type that are distributed to Regular-Rate Periodicals under the Postal Service method. The distribution of item types from which these empty item tallies come is quite reasonable. Nearly 60 percent come from flat trays and brown sacks. Another 18 percent come from white sacks, and 10 percent from pallets. Regular-Rate Periodicals flats are typically entered by mailers as bundles on pallets or bundles in sacks. They are generally sorted to flat trays during processing.

**Table 6**
**BY98 Distributed Empty Mixed Item Tally Costs**
**Regular-Rate Periodicals by Item Type**
**MODS 1&2 Offices**
**(dollar-weighted, millions)**

| Item Type | Tally Dollars | Percent of Total |
|---|---|---|
| Flat Trays | $5.111 | 29.1 |
| Letter Trays | 0.280 | 1.6 |
| Pallets | 1.836 | 10.4 |
| Brown Sacks | 5.093 | 29.0 |
| White #1 Sacks | 0.491 | 2.8 |
| White #2 Sacks | 2.120 | 12.1 |
| White #3 Sacks | 0.574 | 3.3 |
| Other Items | 2.078 | 11.8 |
| Total | 17.583 | 100.0 |

Assumption 3 involves non-identified containers. Looking back to Table 4, we see that the costs associated with these tallies constitute only 0.3 percent of total handling costs. As with non-empty mixed items, there have been suggestions of bias resulting from the types of containers data collectors are unable to identify.[57] Like the non-empty mixed items, it would be impractical to directly observe the data collection process due to the low frequency of non-identified mixed-container tallies. For 1998, only 2 percent of all container tallies ($19.95 million out of a total of $974.91 million total container tally dollars) were non-identified mixed container tallies.

Using Regular-Rate Periodicals as an example, even if none of the non-identified containers were distributed to Regular-Rate Periodicals, that subclass's

[57] Docket No. R97–1, Tr. 26/13833–7 [Stralberg], 14043–5 and 14049 [Cohen].

share of total handling costs would decline by only 0.02 percentage points. The assumption that none of the non-identified container tallies are Periodicals is extreme. Table 7 shows the breakdown of non-identified container tallies distributed to Regular-Rate Periodicals by container type.

**Table 7**
**BY98 Distributed Non-Identified Mixed Container Tally Costs**
**Regular-Rate Periodicals by Container Type**
**MODS 1&2 Offices**
**(dollar-weighted, millions)**

| Container Type | Tally Dollars | Percent of Total |
|---|---|---|
| BMC-OTR | $0.097 | 7.7 |
| ERMC | 0.082 | 6.6 |
| GPC/APC/GPM | 0.292 | 23.4 |
| Hamper | 0.306 | 24.5 |
| Nutting Truck | 0.022 | 1.8 |
| Postal Pak | 0.009 | 0.7 |
| Utility Cart | 0.091 | 7.3 |
| Wiretainer | 0.074 | 5.9 |
| Multiple Items | 0.144 | 11.5 |
| Other | 0.130 | 10.4 |
| Total | 1.248 | 100.0 |

The distribution of container types from which these non-identified container tallies come is quite reasonable. Nearly one fourth come from GPC/APC/GPMs.[58] Regular-Rate Periodicals bundles are commonly sorted into these containers which are also used to transport flat trays. Further, GPCs are frequently part of exigent dispatches where container identification is difficult. Nearly one-fourth come from hampers. Hampers are commonly used in manual bundle-sorting operations, and to hold and transport the contents of broken flats bundles. Like non-empty mixed items, there is no factual evidence of bias in the recording of non-identified container tallies; the costs associated with these

[58] GPC, APC, and GPM are high-sided rolling containers that open on one side.

tallies are too small to make any material difference in the distribution key; and the cost of a survey to investigate this issue would be prohibitive given the relative scarcity of non-identified container tallies.

Assumption 4 uses the subclass distribution of direct items not in containers to infer the subclass distribution of items in containers. It affects identified and non-identified containers, which together represent 8.6 percent of total handling costs. Once again, this assumption cannot be criticized for selection bias. It is, rather, an empirical question that can be resolved by sampling containers and comparing the subclass distribution of the items in containers to the IOCS distribution of direct items.

In 1995, Christensen Associates undertook such a study for platform operations at eight plants.[59] The plants were randomly chosen using a stratified sampling frame. At each site the employees clocked into platform operations were randomly sampled, and the subclass distribution of the mail in items and containers being handled was sampled by teams of Christensen Associates data collectors. The team of collectors made it possible to sample the contents of nearly all observed items and containers—even those with exigent dispatch times.

The platform study produced a relatively small sample from which to draw inferences. Table 8 below compares the subclass distribution of the items in containers to the IOCS direct item subclass distribution for each item type. While they are not a perfect match, there is no evidence of any obvious bias. For

Periodicals, the Platform study yields a larger cost share for Periodicals, but the small sample size of the Platform Study is not sufficient to override IOCS. The point is simply that the Platform Study provides no evidence of bias in IOCS.

[59] See Library Reference LR–I–115.

**Table 8**
**Subclass Profile of Items in Containers**
**Platform Study vs. Platform Dist'n Key**
**All Items (percent)**

| Class | FY95 Platform Study Distribution | FY95 IOCS Platform Dist. Key |
|---|---|---|
| First | 45.7 | 50.6 |
| Priority+Express | 11.4 | 2.6 |
| Periodicals | 13.3 | 11.5 |
| Standard (A) | 25.3 | 32.7 |
| Standard (B) | 2.8 | 1.1 |
| All Other | 1.6 | 1.4 |
| Column Sums | 100.0 | 100.0 |

Assumption 5 involves empty container tallies. As with empty items, the issue is not selection bias, but rather whether or not the empty container tallies provide the same subclass information as identified container tallies. While it would be difficult to deny the connection over all operations, it is conceivable that empty container handlings within a cost pool are not representative of the uses of those containers *in the same cost pool*. For example, if all empty container handlings occurred on the platform, then applying a distribution key derived solely from identified platform container tallies would be biased toward the subclasses disproportionately present in platform containers. However, empty containers are handled in all cost pools. And, while platform handling of empty containers represent one-fourth of all empty container tallies, platform tallies also account for 40 percent of all *non*-empty container tallies.

Even though there is no evidence that a broader distribution would be more accurate, we have calculated subclass costs based on a broad distribution key to quantify the potential impact. We recalculated mail processing costs by subclass using the Postal Service methodology, changing only the way that empty container tallies are distributed to subclass. Under the alternative method, empty container tallies by container type are summed across cost pools and distributed to subclass using a distribution key based on the sum across all cost pools of the costs associated with non-empty container tallies by type. Table 9 compares the final results of our experimental method with the methodology the Postal Service has submitted in this docket.

As Table 9 demonstrates, the differences between the two methods are small. There is no evidence to suggest that the broader distribution of empty container tallies is better—I still believe that distribution of empty container tallies within cost pools is the preferred method. However, these results demonstrate that the debate is largely nugatory given the small difference in the results.

In summary, five key assumptions underlie the Postal Service distribution of non-direct handling tallies. Of these five, only two (#3 and #4) could involve data collector bias. However, even in those two cases, there is no indication of bias; it would be very difficult to check with a survey; and even the most extreme hypothetical corrections would make little difference in terms of relative cost distributions. One of the assumptions (#1) involves the equivalence of the subclass distribution for items outside and inside containers. The small sample study by Christensen Associates did not yield any evidence that would cause us to assume otherwise. Finally, two assumptions (#2 and #5) involve the relationship between empty items/containers and items/containers with mail in them. These are not bias issues, but rather operational questions. There is strong operational evidence to support the assumptions. Our investigation of a broader distribution key for costs associated with empty containers indicates that, such a change would not be preferred, but it would have minimal impact in any case.

**Table 9**

**Comparison of Volume Variable Cost Methodologies**
**BY98 Clerks/Mailhandlers Mail Processing Volume Variable Costs**
**MODS 1&2 Offices**

| Class | USPS Methodology Costs ($000) | Empty Container Distribution Costs ($000) | Difference ($000) | Difference (%) |
|---|---|---|---|---|
| 1st Letter and Parcels | 3,989,434 | 3,990,751 | 1,317 | 0.03 |
| 1st Presort | 968,519 | 967,540 | -979 | -0.10 |
| 1st Cards, Non Presort | 148,792 | 148,725 | -67 | -0.05 |
| 1st Presort Cards | 26,176 | 26,157 | -19 | -0.07 |
| Priority Mail | 522,614 | 528,044 | 5,430 | 1.04 |
| Express Mail | 79,728 | 81,440 | 1,712 | 2.15 |
| Mailgrams | 166 | 165 | 0 | -0.09 |
| Periodicals - Within County | 7,600 | 7,655 | 55 | 0.72 |
| Periodicals - Regular | 411,017 | 411,495 | 478 | 0.12 |
| Periodicals - Special Nonprofit | 69,287 | 69,117 | -170 | -0.25 |
| Periodicals - Classroom | 3,011 | 3,031 | 19 | 0.64 |
| Std (A) Single-Piece | 64,808 | 64,664 | -144 | -0.22 |
| Std (A) Commercial ECR | 208,984 | 208,359 | -625 | -0.30 |
| Std (A) Commercial Regular | 1,409,423 | 1,399,979 | -9,444 | -0.67 |
| Std (A) Nonprofit ECR | 33,768 | 33,401 | -367 | -1.09 |
| Std (A) Nonprofit Regular | 313,770 | 312,367 | -1,403 | -0.45 |
| Std (B) Parcel Post | 74,021 | 75,150 | 1,129 | 1.53 |
| Std (B) Bound Printed Matter | 41,331 | 40,910 | -421 | -1.02 |
| Std (B) Special Standard Mail | 27,310 | 24,121 | -3,189 | -11.68 |
| Std (B) Library Mail | 4,770 | 4,782 | 12 | 0.26 |
| U.S. Postal Service Mail | 91,987 | 92,424 | 437 | 0.48 |
| Free Mail for the Blind/Handicapped | 9,442 | 9,456 | 14 | 0.15 |
| International | 212,644 | 220,436 | 7,792 | 3.66 |
| Registry | 32,978 | 30,433 | -2,545 | -7.72 |
| Certified | 15,022 | 15,516 | 494 | 3.29 |
| Insurance | 1,220 | 1,261 | 41 | 3.33 |
| COD | 232 | 281 | 50 | 21.38 |
| Money Orders | 3,655 | 3,654 | -1 | -0.02 |
| Stamped Envelopes | 122 | 122 | 0 | -0.04 |
| Special Handling | 485 | 489 | 4 | 0.92 |
| PO Box | 2,867 | 2,867 | 0 | -0.02 |
| Other | 32,915 | 33,304 | 389 | 1.18 |
| Grand Total | 8,808,097 | 8,808,098 | 0 | 0.00 |

## D. PENDING FURTHER STUDY OF ALLIED LABOR COST CAUSATION, THE "NOT-HANDLING" PORTIONS OF THE ALLIED LABOR COST POOLS SHOULD BE DISTRIBUTED BROADLY

In Docket No. R97–1, the Postal Service proposed the use of estimated volume-variabilities for the allied operations: platform, opening, and pouching. Dr. Bozzo (USPS–T–15) updates those estimates and reports on some additional analysis. The Postal Service, however, has decided not to incorporate those estimates in the current filing.

My analysis of the allied operations indicates that the allied operations have lower volume-variabilities than the distribution operations—a result consistent with Dr. Bozzo's estimates. To compensate for the use of 100 percent volume-variability for the allied cost pools, the not handling tallies in those pools are distributed to subclasses using a key developed from all cost pools in Cost segment 3.1. This method essentially treats the not-handling costs as variable with respect to all Cost segment 3.1 workload.

The broad distribution of allied costs is used as a compromise, since the Postal Service was not ready to resubmit a method incorporating estimated volume-variabilities for allied cost pools. This compromise yields reasonable results (i.e., subclass costs) when compared to those based on estimated volume-variabilities and distribution keys specific to each cost pool. However, no one should infer that this compromise means that not-handling costs are equivalent to non-volume variable costs, or that non-volume variable costs are correctly distributed broadly over all of Cost segment 3.1.

## E. IOCS-BASED COST POOLS SIGNIFICANTLY IMPROVE THE NON-MODS COST METHODOLOGY

The Postal Service's Base Year CRA introduces a new method for distributing mail processing costs at non-MODS offices. The new method supplants the LIOCATT-like distribution method used by the Postal Service and the Commission in Docket No. R97–1 with a cost pool approach similar to the MODS and BMC methods. The non-MODS operation groupings resemble a simplified version of the MODS cost pools, but are based on activities recorded in IOCS tallies as is done with the BMCs. The motivation for the change is to bring the non-MODS cost distribution method up to the standard of the methods already accepted for the MODS offices and BMCs.

Separate cost pools are defined for the major activity groups in the non-MODS offices. Unlike the MODS plants, the majority of the non-MODS mail processing costs are incurred in manual sortation activities. Besides manual letter, flat, and parcel operations, the other activities carried out in non-MODS offices include some automated distribution (mainly using CSBCS or DBCS equipment)[60] and allied operations. Allied operations includes moving mail into and out of the facility, as well as some "opening" activities such as distribution of bundles and trays to carrier routes. A small amount of cost is associated with dedicated Registry and Express Mail operations. Costs not classified in the aforementioned pools are included in a pool for mail processing support and miscellaneous activities. Table 10 shows the dollar-weighted tallies associated with each of these cost pools for non-MODS offices.

The volume-variable portions of the cost pools are determined using the traditional IOCS-based method; see witness Bozzo's testimony (USPS–T–15) for further discussion. The details of the use of IOCS to obtain volume-variable mail processing costs are covered in the testimony of witness Van-Ty-Smith (USPS–T–17).

[60] Large AOs may have an FSM.

**Table 10**
**Summary of BY98 Mail Processing Tallies (dollar weighted, $000) for Clerks/Mailhandlers**
**All Subclasses**
**Non-MODS Offices**

| | | | Items | | | | Containers | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cost Pool | LDC | Direct Pieces | Direct | Mixed Non-Empty | Mixed Empty | Total | Direct | Identified | Non-Identified | Empty | Total | Grand Total |
| Manual Letter | 14 | 477,670 | 82,123 | 1,096 | 7,549 | 90,768 | 244 | 5,717 | 3,230 | 8,522 | 17,714 | 586,151 |
| Manual Flats | 14 | 313,339 | 61,473 | 676 | 5,781 | 67,930 | 1,083 | 10,592 | 2,167 | 10,389 | 24,230 | 405,499 |
| Manual Parcel | 14 | 79,535 | 2,014 | 529 | 1,254 | 3,797 | 93 | 4,150 | 421 | 8,600 | 13,264 | 96,596 |
| Auto Dist | 11 | 51,554 | 25,740 | 561 | 4,326 | 30,628 | 407 | 4,745 | 0 | 4,175 | 9,326 | 91,509 |
| nRegistry | 18 | 6,703 | 0 | 578 | 88 | 666 | 0 | 245 | 0 | 535 | 780 | 8,149 |
| nExpress | 18 | 5,144 | 432 | 0 | 0 | 432 | 0 | 150 | 0 | 0 | 150 | 5,726 |
| Allied | 17 | 155,902 | 78,422 | 3,736 | 15,912 | 98,071 | 3,409 | 40,475 | 3,520 | 39,384 | 86,788 | 340,761 |
| Misc/Support | 18 | 107,638 | 8,735 | 567 | 2,336 | 11,638 | 235 | 2,651 | 1,313 | 3,299 | 7,498 | 126,775 |

The distribution methods are generally the same as those used for comparable MODS cost pools. For sortation operations, the volume-variable costs are distributed using tallies in the same operation, and mixed-mail tallies are "filled" using direct tallies in the same operation if possible. The not-handling tallies do not contain information on the subclass distribution of the cost driver and are therefore ignored. In the case of the allied and mail processing support pools, the not-handling tallies receive cross-pool distributions. The allied not-handling distribution includes the manual distribution, automated distribution, and Express cost pools; the not-handling tallies in the support cost pool are distributed over all non-MODS cost pools. Again, witness Van-Ty-Smith provides complete technical details.

## F. NEW "ENCIRCLEMENT" RULES ARE NEEDED TO ENSURE APPROPRIATE DISTRIBUTION OF VOLUME-VARIABLE COSTS TO SPECIAL SERVICES

In this docket, the Postal Service has implemented new encirclement rules to assign tallies to subclasses that had previously been assigned to special services. The details of the new encirclement rules are provided by witness Van-Ty-Smith. The reasoning behind the change is discussed here.

The theory set out by Dr. Christensen in Docket No. R97–1 indicates that volume-variable mail processing costs should be distributed to special services to the extent that they "cause" handlings (or, more generally, that they cause the volume-related cost drivers) in an operation. Many observed handlings of mailpieces endorsed for special services are not caused by the special services because the handlings would still have been necessary to process the pieces had they been mailed without the service. Therefore, many IOCS direct tallies of pieces bearing special services result not from the provision of the special service, but from the handling of the pieces as mail of the underlying subclasses (the "normal feature").[61] Since the Postal Service offers special services as "add-ons" to mail pieces of eligible subclasses–the mailer pays the special service fee in addition to postage–the special service volume-variable costs must exclude the "normal feature" cost of the pieces.

### G. SOME STREAMLINING OF DISTRIBUTION KEY PROCEDURES HELPS THE POSTAL SERVICE'S DISTRIBUTION KEY METHODS TO BETTER MATCH THE THEORY LAID OUT BY WITNESSES PANZAR AND CHRISTENSEN IN DOCKET NO. R97–1

The volume-variable cost distribution methods proposed by the Postal Service in Docket No. R97–1, and adopted by the Commission, includes some features that may not be in full accord with the distribution theory laid out by witnesses Panzar and Christensen. In theory, the distribution key should represent the subclass distribution of the volume-related cost driver(s). Dr. Christensen noted that for most mail processing operations, the appropriate subclass distribution is that of the mail handlings in the same operation. He also showed that the appropriate subclass distribution could be represented by the subclass distribution of the IOCS handling tallies.[62]

While mixed-mail tallies convey information on the mail handled in various cost pools by virtue of the close relationship between mail items and containers and certain shapes and/or classes of mail, not-handling tallies convey no such information. Therefore, the appropriate treatment of not-handling tallies for the purpose of constructing distribution key shares for volume-variable costs is to

[61] Some services—e.g., Certified—provide for no additional or preferential handling in processing and distribution, beyond that afforded the underlying mail subclass.

[62] Docket No. R97–1, Tr. 34/18221–2.

ignore them.[63] For some cost pools—primarily, special service related cost pools—the Docket No. R97–1 distribution method did so, by distributing not-handling tallies in proportion to all direct and distributed mixed handling tallies (including special services).[64] However, in other cost pools, the not-handling distributions excluded the special services, with the effect of raising the distribution key share of (collectively) the mail subclasses and lowering the collective share of the special services, relative to the shares based on the handling tallies alone. Since the distribution keys for the affected pools had little weight in the special services, the differences between the handling shares and the final distribution key shares for the subclasses were small. Particularly combined with the proposed encirclement changes, however, the Docket No. R97–1 treatment would tend to underdistribute volume-variable costs to the special services. Therefore, the Postal Service's proposed distribution method eliminates the differential treatment of special services in the distribution step for the not-handling tallies. In the cost pools where broadly based not-handling distributions are not warranted, this has the effect of basing the distribution key shares on the observed handlings alone.

[63] This would also be the appropriate treatment of not-handling tallies in allied operations, once causal models of allied labor volume-variable costs are available.

[64] In this case, the distribution key shares are unaffected by the not-handling distribution.